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Agriculture

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Twilight of the year

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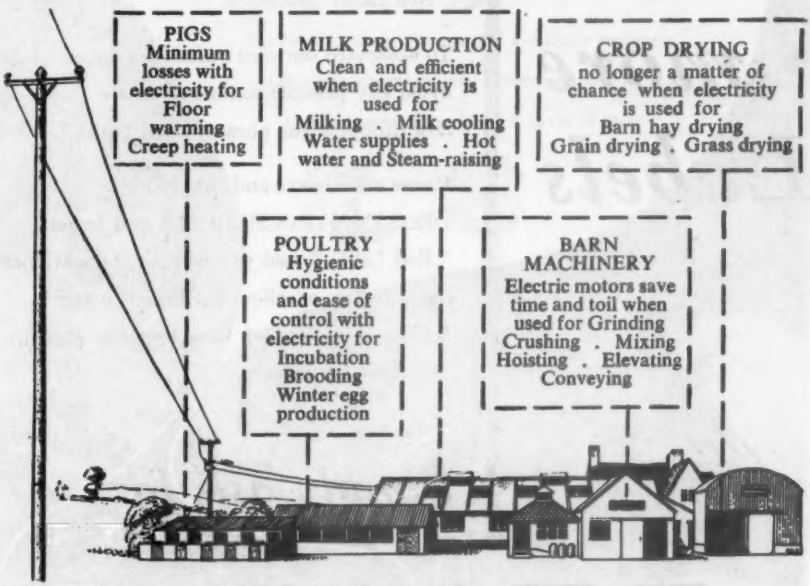

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AGRICULTURE

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AGRICULTURE

VOL. LXIII No. 8 NOVEMBER 1956

ERADICATION OF BOVINE TUBERCULOSIS, 1935-56

M. F. HAYNES, O.B.E.

Ministry of Agriculture, Fisheries and Food

A summary of the unremitting struggle over the past twenty-one years to rid the herds of Britain of bovine tuberculosis.

SINCE the early part of this century, tuberculosis in cattle has been recognized as an important disease on account of the very serious direct losses which it causes through the death of affected cattle, and in its effect on the productive capacity of animals in which the disease may exist in a more chronic form. Medical opinion also recognized that the problem was of special significance from the point of view of public health, as it was found that the bovine type of organism was far more common in human cases than was supposed. While no statistical information existed as to the actual extent of tuberculosis in cattle, there was abundant evidence indicating that its incidence among cows in the early 1930s was probably as high in Great Britain as anywhere in the world. The incidence and distribution of the disease varied widely in different areas of the country. Within individual herds the amount of infection was considerably influenced by the method of husbandry. The greatest weight of infection existed in herds around the large cities and industrial areas, where the cattle population is dense and intensive milk production is practised. On the other hand, in the remoter hill and upland areas the amount of infection in general was appreciably less. There was little doubt that the problem was one of considerable magnitude, and that inevitably the task of eradicating bovine tuberculosis would be long and formidable.

The Voluntary Attested Herd Schemes A Committee of the Economic Advisory Council under the Chairmanship of Sir Gowland Hopkins was appointed in 1932 to consider, among other things, what practical measures could be taken to reduce the incidence of bovine tuberculosis and to improve the milk supply. The Committee accepted that 40 per cent of all cows in the country were probably infected to some degree with tuberculosis, and stated that "the total eradicaion of bovine tuberculosis is the only complete solution of the problem of tuberculous milk". They also saw the practical difficulties to be met with in any eradication scheme, having regard to the prevailing methods of farming in this country and the necessity to avoid undue interference with the free flow of additions and replacements on which the whole cattle industry is based. The Committee, therefore, limited their recommendations to the institution of a voluntary scheme for the establishment of a list of tuberculosis-free herds officially certified to be such after periodical testing with

tuberculin, accompanied by the offer of financial inducements to herd owners participating in the scheme to undertake the work of freeing their herds from tuberculosis.

The Committee's recommendations were accepted by the Government of the day. From the outset it was appreciated that it would be impossible to bring about any rapid reduction of the incidence of bovine tuberculosis. For example, a process of eradication by a systematic application of the tuberculin test and the compulsory slaughter of reactors was ruled out as impracticable, not only because of its prohibitive annual cost in compensation but also on account of the dislocation it would cause and the serious shortage of meat and milk that would ensue. It was, however, considered that a start could be made with a practicable method of establishing an official register of tubercle-free herds which would form a nucleus capable of gradual expansion, and which would be available for replenishing other herds from which the disease was being eradicated.

One of the greatest difficulties in the formulation of the first schemes was to devise a method of creating and maintaining tubercle-free herds without attaching such onerous conditions and rules that might discourage farmers from joining. The conditions and rules prescribed in the first schemes, which have become a pattern for the later schemes, were determined by the nature of the disease itself, and were restricted to the minimum regarded as essential for the purpose.

The first Tuberculosis (Attested Herds) Schemes came into operation in England and Wales and Scotland on February 1, 1935. They were made under the Milk Act of 1934, which provided £750,000 over a period of four years to assist in obtaining a milk supply free from disease. Registers were established of attested herds, and a bonus of 1*d*. per gallon of milk produced from an attested herd and sold under a milk marketing scheme was offered to farmers as an inducement to co-operate. The schemes made only slow progress at first.

As a result of the Agriculture Act, 1937, the schemes came under the control of the Minister of Agriculture and Fisheries. A new scheme was started with effect from July 1, 1938, and as an alternative to the bonus of 1*d*. per gallon of milk, offered six half-yearly payments at the rate of 10*s*. per head of animals in the herd.

In the period from 1935 to the end of 1939, 13,874 attested herds had been established, representing about 6 per cent of the cattle in the country. During the war no progress was made, and new entrants to the scheme were restricted to owners of herds already producing T.T. milk. At the end of 1944 only another 3,102 herds had been added and attested cattle represented about 7 per cent of the total stock. In July 1944, the scheme was re-opened to all types of herds and this, with the increase to 4*d*. a gallon from October 1, 1943 in the premium paid to producers of T.T. milk, resulted in a steady increase in attested herds, so that in the third five-year period 29,913 herds became attested and the percentage of attested cattle rose to nineteen.

The Final Stage The final stage in the campaign against bovine tuberculosis started on October 1, 1950, when a revised voluntary Tuberculosis (Attested Herds) Scheme was introduced, and simultaneously a plan for the eradication of the disease on an area basis was started. It provided bonus payments on a milk or capitation basis, thus giving an incentive to owners of beef and breeding herds as well as of dairy herds. At September 30, 1956, the number of attested herds had increased to 163,351, and the percentage of attested cattle had reached sixty-eight. The average

number of herds becoming attested each *month* since 1950 has exceeded the number added each year during the first ten years of the scheme, and that rate of progress is being maintained.

A wide variety of incentives have been offered to encourage herd owners to eliminate bovine tuberculosis. The existing rates of bonus are 2*d.* per gallon on milk sales for four years, followed by 1*d.* per gallon for a further two years, with the alternative of a capitation bonus of £2 per head for four years for each animal in the herd, and £1 per head for a further two years. With the introduction of these rates, the quality milk premium of 4*d.* a gallon for milk sold under a Certified or Tuberculin Tested licence was reduced to 2*d.* In order that owners of existing Certified and Tuberculin Tested herds which were neither attested nor "supervised" might be enabled to receive a total of 4*d.* per gallon, special provision was made to recognize such herds as "supervised" herds, which since 1950 have also been eligible for bonus. In October 1954, the use of the special designation "Accredited" ("Standard" in Scotland) was brought to an end on the granting or renewing of a Certified or Tuberculin Tested licence that the herd should be attested or in a Tuberculosis Attested or Eradication Area.

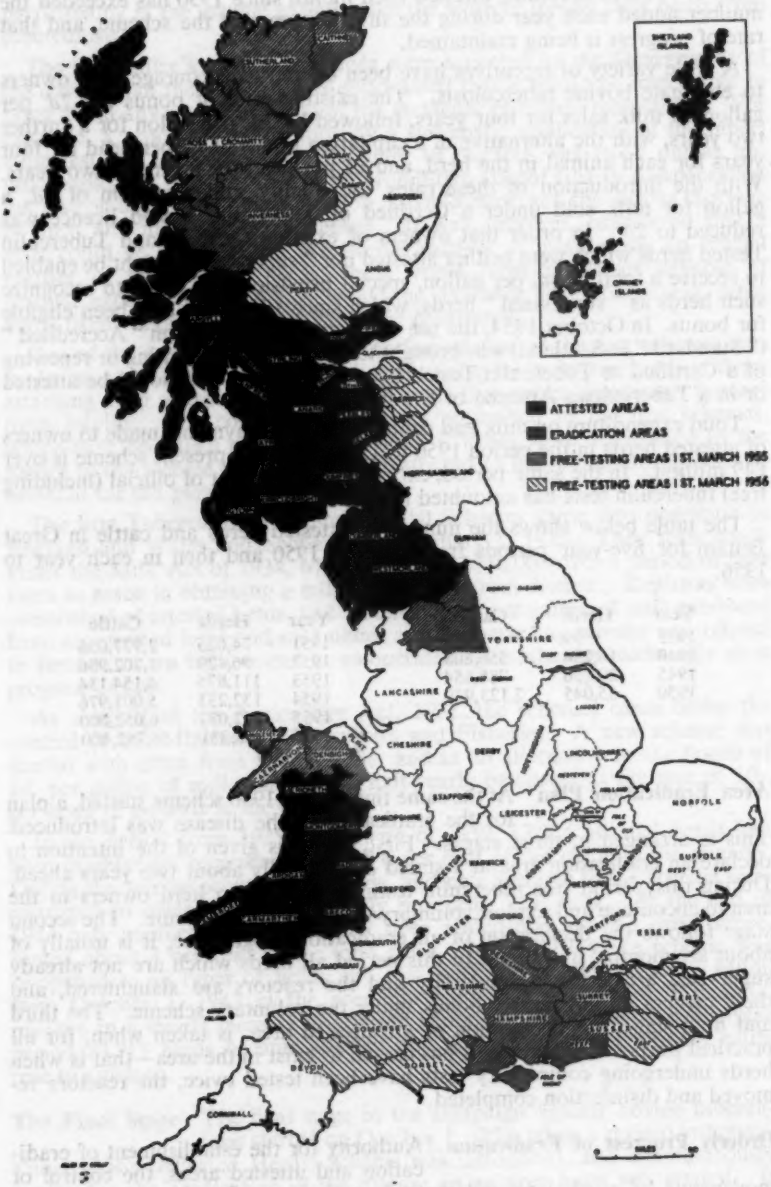
Total expenditure on milk and capitation bonus payments made to owners of attested herds in the period 1950 to 1955 under the present scheme is over £49 million. In the same period, expenditure in respect of official (including free) tuberculin tests has amounted to £4.8 million.

The table below shows the number of attested herds and cattle in Great Britain for five-year periods from 1935 to 1950 and then in each year to 1956.

Year	Herds	Cattle	Year	Herds	Cattle
1935	99	5,731	1951	74,025	2,977,056
1940	16,294	556,808	1952	96,429	3,702,986
1945	20,036	788,654	1953	111,875	4,154,134
1950	55,045	2,123,920	1954	132,233	5,003,976
			1955	152,077	6,052,000
			1956 (to Sept. 30)	163,351	6,792,400

Area Eradication Plan At the same time as the 1950 scheme started, a plan for the eradication of the disease was introduced. This is arranged in three stages. First, notice is given of the intention to declare an eradication area at a stated date, usually about two years ahead. During this period free tuberculin testing is offered to herd owners in the area to encourage and exploit voluntary response to the scheme. The second stage follows the declaration of an eradication programme; it is usually of about six months' duration. In this period all herds which are not already supervised are tested compulsorily and the reactors are slaughtered, and these owners do not receive bonus under the voluntary scheme. The third and final stage, the declaration of an attested area, is taken when, for all practical purposes, tuberculosis has ceased to exist in the area—that is when herds undergoing compulsory tests have been tested twice, the reactors removed and disinfection completed.

Orderly Progress of Eradication Authority for the establishment of eradication and attested areas, the control of movements of stock into and through such areas, for the valuation and slaughter of reactors and for the payment of compensation is contained in the Tuberculosis (Area Eradication) Order, 1950; the Tuberculosis (Slaughter of Reactors) Order, 1950; the Tuberculosis (Compensation) Order, 1950; and the Tuberculosis (Area Eradication) (Amendment) Order, 1954. The



AREA ERADICATION PLAN FOR TUBERCULOSIS
Position at March 1, 1956

areas themselves are declared by local Orders, which may make variations in the application of the general Order to a particular area.

To reduce as far as possible interference with the normal pattern of trade, areas on the mainland selected for development are usually large, self-contained geographical units which may comprise two or more counties or parts of counties and within which there must be adequate and suitable marketing facilities. Island areas are normally treated separately on their merits.

After the Area Plan was introduced on October 1, 1950, it was possible to declare on February 1, 1951 three small island areas as attested areas. These were the Scilly Isles, the Shetland Islands and the Island of Arran and Great and Little Cumbrae in the County of Bute, and they achieved attested status without the need for free testing and subsequent processes. On the mainland, free tuberculin tests were offered in two large areas, namely, south-west Scotland and south-west Wales, on October 1, 1950. These contained about 620,000 and 340,000 cattle respectively. The larger part of each of these areas became attested areas on April 1, 1953, and the smaller part of each, which had undergone a longer period of free testing, was added to the areas on July 1, 1954.

In February 1953, free testing started in four more areas; in the north-west of England and mid-Wales, in central Scotland and the Hebrides. These four areas contained altogether about 850,000 cattle, and they were declared attested areas on October 1, 1955.

On March 1, 1955, free testing began in areas in the north of Scotland, in the south of England and in North Wales. These three areas contained approximately 900,000 cattle, and are expected to be declared eradication areas on March 1, 1957.

On March 1, 1956, free testing was started in areas in south-east and south-west England, and in north-east, central and south-east Scotland, which altogether contained about 1,400,000 cattle. It is expected that these areas will be declared eradication areas in March 1958.

In the evolution of the Area Plan it is satisfactory to record that very few herds were left for compulsory testing. In the first South Wales area, only 197 herds, representing 1.7 per cent of the cattle in the counties, required to be tested compulsorily, and there were only 282 herds, representing 8.5 per cent of the population, in the second area. In the first Scottish area, 29 herds, or 0.2 per cent of the population, were tested compulsorily, and in the second, 64 herds, or 0.63 of the total cattle. In one area in mid-Wales the first round of compulsory tests showed 17.4 per cent of reactors. At the next round the figure was 1.7 per cent, and in the third round none. In the North of England the corresponding percentages were 15.6, 2.6, and none. In the northern part of Argyllshire and in the Western Isles the figure in the first round was 7.7, and none was found subsequently. In the area in the middle of Scotland, there were 3.2 per cent reactors at the first round, 0.45 per cent at the second, and none in the third round. It is interesting to record that in south-west Wales in the first round there were as many as 29.8 per cent reactors, but in the second round only 2.6 per cent.

The map opposite shows the present position in regard to the development of the Area Eradication Plan.

Reactors and Payment of Compensation Over the years there has been some fluctuation in the incidence of reactors in attested herds, but broadly the number of reactors removed from herds is at the rate of three in every thousand animals tested. Co-

operation with health authorities and knackeries ensures that any diseased animal found there can be traced to its source and the herd of origin check-tested. In eradication and attested areas all cattle which react to the tuberculin test are slaughtered with payment of compensation on the basis of the market value of the animal as an untested animal, subject to a maximum of £100. Outside those areas reactors in attested herds which have been registered for not less than four years are also slaughtered at the option of the owner, with payment of compensation on the same basis.

The following table shows the number of cattle slaughtered as reactors in 1950 to 1955 and the amount of compensation paid:

Year	Number of Reactors Slaughtered	Compensation (gross) £
1950	—	—
1951	5	210
1952	1,935	94,102
1953	1,819	102,554
1954	4,941	282,075
1955	10,842	645,792

Summary of the Position At September 30, 1956, there were 163,351 attested herds in Great Britain (England 89,775; Wales 35,142; Scotland 38,434). These herds contained nearly 6,800,000 cattle, or 68 per cent of the total cattle population of Great Britain. The percentage of attested cattle in England was fifty-eight, in Wales eighty-seven and in Scotland eighty-two. Over 2,000,000 cattle (one-fifth of the total cattle population of the country) are now in Attested Areas. The number of badly infected cattle slaughtered under the Tuberculosis Order of 1938 has dropped from the pre-war level of 20,000 a year to about 1,250. Of the milk sold in Great Britain, 75 per cent is produced from herds which are regularly tuberculin tested, as compared with 42 per cent five years ago and only 15 per cent ten years ago.

The rate of voluntary attestation has been greatly accelerated during the last few years, and its momentum is being maintained. There is indeed every reason to hope that by the early 1960s bovine tuberculosis in Great Britain will for all practical purposes be a thing of the past.

Timber Development Association Brochures

Specifications make dull reading but what a transformation when they are accompanied by pictures! The Timber Development Association has just published two pamphlets entitled Timber Fencing and Gates—one for "agricultural and open space purposes" and the other "for housing and other buildings". These attractive booklets are virtually "picture books" of the British Standard for Fencing and should be extremely useful to anyone uncertain as to what type of fence he wants and how to put it up. As well as the specifications, there are useful notes on preservative treatment. At a time when great quantities of forest thinnings are coming on to the market, these brochures are particularly welcome.

CURRENT THOUGHTS ON WINTER MILK PRODUCTION

KENNETH N. RUSSELL, B.Sc., N.D.A.(Hons.), N.D.D.(Hons.)
Principal, Yorkshire (W.R.) Institute of Agriculture

How to maintain milk sales on what feed they have is likely to be the main problem for dairy farmers this winter.

IN many parts of England and Wales, particularly in the north and west, the weather of 1956 will be linked in the memory with that of 1954. A late spring followed by a long spell of inclement weather has given greatly reduced stocks of winter fodder and much of it of very inferior quality. This is bound to affect the production of milk adversely, by reducing the volume of sales or by raising production costs at a time when other component costs in milk production, in the form of wages and purchased feeds, are also rising. Dairy farmers short of hay or other fodder will be scratching their heads this winter to decide how best to make the rations go round. What are the possibilities?

Firstly, I would stress the importance of an adequate stock-taking to assess the present stock-carrying capacity of the farm according to the available feed supplies of hay, silage, roots and so on, in relation to the stock to be fed during the winter. On this assessment will rest the decision whether it is wiser to reduce stock numbers or to buy in additional feed. There is no disputing the fact that purchased concentrates as cake or cereal grains are considerably more expensive than home-grown feed, but in the absence of sufficient home-grown feed purchased foods *can* be used profitably, provided they are devoted to actual production of milk rather than to the maintenance of a stocking rate beyond the capacity of the farm food supplies. Over-stocking this coming winter is therefore to be avoided by culling all stock likely to be unproductive in the sense that they make no direct contribution to the farm income during the winter. On the majority of dairy farms, low-yielding cows and any surplus young cattle should be sold off *now*, before they have lost their summer flesh. This is particularly true of any beef stores reared on dairy farms. Available home-grown foods can then be devoted to fewer mouths, and the labour available applied more intensively to the productive livestock left on the farm.

Balancing Stock Numbers with Food Supplies According to breed of cow, the minimum feed requirement (as hay) for the winter can be reckoned as follows: Live weight of cow in cwt × 3, giving in the case of 10 cwt cows a winter consumption need of 1½ tons. Root crops (kale or mangolds or swedes) can be reckoned to replace ¼ of their weight of hay, silage ⅓ and straw ½, so that the total feed supplies available can be reduced to the equivalent tonnage of hay. This tonnage related to the requirement per cow or per two young cattle gives the stock-carrying capacity of the farm.

			Hay equivalent
Thus on a farm with, say,	30 tons	hay ×1 =	30 tons
	20 „	straw ×½ =	10 „
	60 „	kale ×¼ =	15 „
	60 „	silage ×⅓ =	20 „
		Total	75

Thus the stock-carrying capacity is $\frac{75}{1\frac{1}{2}} = 50$ cows of 10 cwt live weight, or 35 cows and 30 followers. To try and keep more than this number will entail buying additional foods to do what is normally expected of home-grown foods, and will add to the feed bill with no increase in milk sales.

The first step is thus to cull the herd, and then to consider how to make best use of available feed supplies and what feeds to purchase in addition (if any).

Planning the Best Use of Available Feed Hay is a most valuable winter feed; it helps to keep the cudding activity of the cow—"her rumen digestion apparatus"—in good order. It should be fed so as to supply, as far as possible, a constant level of feed all winter, and to supplement this basal hay ration, kale or other roots, silage and straw may be available, or recourse made to purchased feeds such as beet pulp or wet brewers' or distillers' grains (draff).

When roots are available—kale in early winter followed by swedes or mangolds—straw can be used advantageously to supply roughage in lieu of hay, provided it is fed long and the cow allowed to eat the more palatable and less fibrous material. Thus 4 lb straw and 24 lb kale (or swedes) will replace 8 lb hay. Such a substitution is most applicable to low-yielding cows, whereas with cows in early lactation hay substitutes of the type of sugar beet pulp (fed slightly soaked) and wet grains are advisable. The aim with high-yielding cows, or fresh calvers, is to keep their feed intake at a high level. Dry matter consumption tends to be lowered by a diet which is too succulent or contains too large a proportion of foods high in fibre.

Reserve the best hay for the freshly calved cows: as lactation proceeds, poorer quality hay can be used. The same applies to hay substitutes. As a guide to feeding practice, the following table is worthy of study:

Guide to the Use of Hay and Hay Substitutes

Quality of Hay		Suitable Substitutes per lb of Hay	Stage of Lactation when Fed
Good	1.	½ lb cereals (oats, barley or dried beet pulp) 2 lb first quality silage (protein over 14%)	Early lactation
	2.	½ lb cereals ½ lb first quality dried grass	
	3.	½ lb cereals 1½ lb wet brewers' grains	
	4.	4 lb kale or beet tops or swedes ½ lb straw (fed long)	
Average	1.	2½ lb grass or arable silage (protein 12-14%) ½ lb straw	Mid- to late-lactation
	2.	3 lb kale or beet tops ½ lb straw	
	3.	½ lb cereals 1 lb wet brewers' grains	
	4.	½ lb straw 4 lb mangolds or swedes	
	5.	½ lb straw ½ lb dried beet pulp (fed soaked)	

(For notes on supplementation of *poor* hay see p. 363.)

Silage on many farms has already taken the place of hay as the chief winter fodder. The reduction of losses in making due to bad weather compared

with those in haymaking is the strongest argument for its wider adoption. Even the poorer quality silages have sufficient protein content to enable some straw to be fed, and in the case of high moisture silage this is an advantage to the cow. So plan to use silage over as long a period as possible, with other low protein feeds fed in conjunction.

Thus to save silage, a moderate allowance of, say, 28 lb a day can be supplemented with straw and mangolds—for example, 28 lb silage fed with 7 lb straw and 28 lb mangolds will provide the equivalent of 56 lb silage for maintenance purposes without the cow being short of protein.

Kale, sugar beet tops and *swedes* are most useful hay supplements used in conjunction with straw, particularly for cows past their peak of lactation, or used in moderation (say, 28-35 lb daily) for higher yielders. Indigestion troubles are often due to soil contamination. If kale is cut and carted or beet tops fed off, be sure to keep soil contamination to a minimum. A wise maxim with root feeding is "little and often"; no "meal" of roots should, in my opinion, exceed 28-35 lb, and a previous feed of roughage—hay or straw—should have been provided to activate cudding and normal rumen digestion. When grazing kale, two 1½ hour periods (one after each milking) are preferable to one long grazing period of 3-4 hours during the middle of the day.

Mangolds or *fodder beet* are low in protein and are best used for feeding low-yielding and dry cows. Fed with straw instead of hay, the whole ration is likely to be mineral-deficient, particularly if little concentrates are being fed; hence the advisability of providing mineral licks to such cows. Roots are an excellent "belly filler", and all stockmen know how important it is to satisfy the appetite if stock are to be content and thrive.

Sugar beet pulp, brewers' or *distillers' grains* (wet or dried) are purchased feeds available to a greater or less extent in certain areas, but where they are obtainable they can serve a very valuable purpose, particularly in "boosting" the value of low quality feeds for the benefit of high-yielding or freshly calved cows. Where hay or silage is of poor quality, milk yields will soon suffer, and the remedy is not to feed, say, 24 lb of poor hay to replace 16 lb of good, but to make up any deficiency by feeding beet pulp or grains to boost the feeding value of the 16 lb of poor hay. Where hay is of doubtful quality, the following scale of supplementation is suggested:

Type of Hay	Amount Fed	Supplement with	Equivalent to
Poor	8 lb	1½ lb dried (grains, beet pulp or oats) *or* 6 lb wet (grains or beet pulp)	8 lb good hay
Medium	8 lb	1 lb dried beet pulp, etc. *or* 4 lb wet grains, etc.	8 lb good hay

Thus where the normal maintenance ration is reckoned to be, say, 16 lb of good hay, the feeding of poor quality hay at the same level would require an additional feed of, say, 3 lb beet pulp (or oats) or 12 lb wet grains or soaked beet pulp.

Saving Food There is an old saying that "a dry back is worth an extra feed", which is very true in that shelter from wind and rain can materially reduce an animal's maintenance requirements. Choice of outwintering pastures to give shelter and full utilization of yarding accom-

modation, even the construction of temporary straw yards, is worth consideration. Comfortable cattle save food.

Recent research work, notably by Dr. Blaxter and his colleagues, has confirmed what I have found in practice, that our text-book standards in cattle feeding tend to *under-estimate the energy needs of cattle on the farm,* unless given every comfort. Sub-normal production follows sub-normal feeding, reinforcing my plea for farmers to sit down and work out some definite feeding plan to meet the present emergency and to carry out that plan. To attempt to save food by what amounts to under-feeding is false economy, and to have to feed too many mouths on inadequate supplies of bulk feeds means probable overfeeding of expensive concentrates and high costs of production. This is too often the case already.

Such a season as this underlines the need for dairy farmers to be even more alive to the fundamental importance of planning a winter feeding programme on as wide a basis as the possibilities on their farms allow. Whether it be by making wider use of catch cropping or forage farming, better grass and more silage, or by better use of arable crops and by-products, the choice and responsibility is theirs. The gap between the cost of home-grown and purchased foods is such that today milk production can no longer be regarded as a "processing" industry but requires a higher degree of farming skill and no less knowledge of the art of cowmanship. A good cow, like a good pasture, must be properly fed; to produce milk at the expense of the cow is likely to lead to problems of milk low in solids-not-fat, and in my experience the majority of our dairy cows would respond to better levels of feeding, particularly during the dry period and the first 120 days of lactation. That is when the bulk of the work is done, and milk production is hard work. Avoid the mistake of giving them "too little and too late" by starting the supplementation of failing pastures in good time.

Feeding to Yield One last word needs to be said, and that is "feeding to yield" is so often left to chance. There is still considerable scope on many farms for tightening up the rationing of concentrates. To feed 1 lb in excess of concentrates, per cow per day, over the winter may well cost an additional £3 per cow in feeding costs, and few of us would like to state that this does not occur, even in well-managed herds. The moral is to keep a constant check on what leaves the farm in the milk churn, compared with what leaves the granary in the bag. Without milk recording and its correlated food recording, no dairy farmer can claim to be efficient, and unless he feeds concentrates according to yield, he has no means of checking on the adequacy, or otherwise, of his bulk feeds. Concentrates are supplements and not substitutes for bulk feeds if milk production costs are to be kept down. And that is the primary answer to maintaining profitability in winter milk production.

The assessment of the feeding value of home-grown fodders by eye without the evidence afforded by the cow's own performance (by when it may be incapable of remedy) is not easy, so if in doubt make full use of the facilities for analysing hay, silage and so on, made available by the N.A.A.S. To be forewarned of possible inadequacies in one's feed supplies enables forward action to be taken. The anticipation of trouble before it occurs is a fundamental of good stockmanship.

THE GRADE AND DEADWEIGHT WAY

EDWARD DUNNILL

Ministry of Agriculture, Fisheries and Food

The simpler scheme for the sale and certification of livestock for guarantees on the hook operating in 1956-57 is described and farmers are advised on the points for which the grader looks.

WITH the introduction of the Fatstock Guarantee Scheme on July 1, 1954, producers of livestock were told that they could sell their livestock to anyone they liked, anywhere they liked, and in any way they liked. They were no longer to be tied to one market as they were when the market was controlled, but, to get the price guarantee, they had to sell

by auction at any "approved" fatstock market; or

by private treaty at approved fatstock markets or deadweight centres; or

by grade and deadweight through one of the Ministry's recognized schemes (i.e., Fatstock Marketing Corporation, wholesalers, etc.).

How the producers would choose to sell their stock and where they would send it to get the guarantee payments was a major problem, but the scheme started with a pattern of "approved" fatstock markets and deadweight centres which, geographically, covered the country fairly well.

There were about 660 "approved" fatstock markets and 500 deadweight centres operating in Great Britain when the scheme began. Included in the 500 deadweight centres were 220 bacon factories and 112 centres for pigs only. From July 1, 1954, to the end of March 1955 the scheme revealed the pattern of the producers' marketings as follows:

Presentation for Guarantees
Weekly Average

	Liveweight	Deadweight	Total
Cattle	27,000	7,000	34,000
Sheep	115,000	43,000	158,000
Pigs	66,000	136,000*	202,000
Grand Total	208,000	186,000	394,000

* Includes 104,000 pigs dealt with at bacon factories.

Grade and Deadweight Facilities As the Fatstock Marketing Corporation and similar wholesale organizations extended their operations and producers made known their requirement, it was obvious that more points were needed for deadweight certification and grading.

The following table shows how the facilities were increased:

	Centres for All Classes of Stock	Centres Pigs only	Bacon Factories
July 1954	166	112	221
July 1955	426	467	217
July 1956	572	505	214

Staffing of Grade and Deadweight Centres It was very difficult to staff these centres, since the changeover from control to a free market (and the payment of guarantees) occurred overnight. Men with a wide knowledge of grading and experience in the trade were in demand both by commercial concerns and by the Ministry. Winding up the control arrangements and simultaneously organizing the new scheme was a hard job, but, apart from one or two minor crises, the staff were in post on July 1 and carrying out their new work.

THE GRADE AND DEADWEIGHT WAY

At deadweight centres and approved bacon factories, graders experienced in the trade were appointed to certify and grade the stock. Many of them had had long service in the Ministry of Food on similar work during control, and many had pre-war experience with the National Mark Scheme and the Pig Marketing Board. At centres dealing with pigs only, some of the certification work had to be carried out by local authority meat inspectors, because pig farming was so widespread that it required facilities at places which could not be economically serviced by full-time employees.

1956-57 Fatstock Guarantee Scheme The current scheme is considerably simpler than its two predecessors. A single guarantee is now paid on all types of eligible livestock, with the exception of bacon pigs weighing (deadweight) between 7 score and 8 score 15 lb and having certain back fat measurements. This type of bacon pig attracts a quality premium of 2*s*. per score in addition to the guarantee payment.

Sales by grade and deadweight are no longer restricted to Ministry-recognized schemes, and producers wishing to sell cattle, sheep and pork pigs can choose freely where and to whom they sell. Bacon pigs which attract the quality premium in addition to the normal guarantee must, however, be sold to bacon factories which are approved as certification centres. Practically all bacon factories are recognized as certification centres.

The presentation of stock for guarantees, either at liveweight markets or deadweight centres, does not make any difference to the actual payments made, since the agreed killing-out percentage takes care of the final return to the producer. The producer does, of course, accept the risk of condemnation by the Meat Inspector of the local authority if the animal is presented for certification on a deadweight basis, because the payments are not made on the weight of the meat condemned.

A booklet, *Deadweight Certification under the Fatstock Guarantee Scheme*, which is available from the Grade and Deadweight Branch, Fatstock Marketing Division, Ministry of Agriculture, Fisheries and Food, Guildford, explains fully the way the producer can obtain deadweight certification and make use of the weighing and grading service.

Before presenting stock, the producer must obtain a presentation form from the meat grader at his local centre (slaughter-house). On this form, he gives details of the livestock he is sending in for certification for the Guarantee Scheme, and posts the form to the meat grader four days before the stock is due to arrive. The form contains an important undertaking (which the producer signs) that none of the stock has previously been presented by the producer for certification under the Fatstock Guarantee Scheme, and that none of the animals bears permanent certification marks.

Producers should always examine the ears of the animals before sending them to the slaughter-house to make sure that no such marks exist. Purchases from the store market should always be examined carefully because store animals which have been previously certified for guarantee payments have sometimes been presented again for certification. Producers can always see their animals classified for the scheme if they wish, and the grader will explain the reasons for rejecting any carcass. Arrangements for slaughter must, of course, be made with the slaughtering contractors or with the owners of the slaughter-house.

Methods of Selling Many producers sell their animals to the Fatstock Marketing Corporation, and similar organizations, which publish a weekly price list. The prices quoted include the guarantee

payments, and the guarantees are subsequently paid direct to the presenter of the stock, that is, F.M.C., etc. Since the introduction of the 1956-57 scheme with a single guarantee payment, the number of direct sales between local farmers and local butchers has increased. In these sales, the butcher usually buys on a headage rate inclusive of the guarantee, and draws the guarantee from the Ministry after the stock is certified for the guarantee payments.

Similar arrangements for buying are made by bacon curers, but where the quality premium of 2*s*. per score is payable, the sale must always be on a grade and deadweight basis to ensure that the premium is passed on to the producer and that the right type of bacon pig is encouraged.

Where the buyers of livestock, such as the F.M.C., publish lists of prices for types and grades of animals, the carcasses are graded and weighed by the Ministry grader, and it is on the result of his grading that the actual payment is made to the producer. The Ministry grader is, of course, in a position to be entirely neutral and unbiased, and he works independently of either buyer or seller.

Producers who wish to sell their stock on a grade and deadweight basis can also use the Ministry's grade and deadweight scheme. For this the producer has to give the following information to the grader:

(a) number and class of animals offered
(b) breed or cross
(c) approximate age
(d) approximate live or deadweight
(e) if sheep, whether "in wool"
(f) if lambs, whether castrated
(g) any further particulars of a special nature.

The grader obtains quotations from a number of approved wholesalers and lets the producer know what is the most favourable offer and the time within which it must be accepted. The quotation is according to grade and is per lb dressed carcass weight, sinking the offal—that is, the price covers also the sale of the offal not included in the weight of the dressed carcass.

Grading and Weighing Services The grading of carcasses is not now an integral part of the Fatstock Guarantee Scheme for 1956-57. However, to provide the necessary basis on which much of the livestock is sold, as described above, the Ministry's Fatstock Marketing Division maintains a grading and weighing service at the majority of deadweight centres. The work is done by the meat graders, and the producer is informed of both the weight and grade of the carcass. The service is also available for all types of stock, including those which are not eligible for guarantee payments, but in some cases (for example, boars) only the weights are provided.

This service allows the producer the opportunity of knowing what type and grade of meat his stock produces and the definite killing-out weights.

The charges payable for the grading and weighing service are as follows:

Grading of carcasses eligible for guarantee purposes

Cattle	1s. 0d.
Sheep	3d.
Pigs	4d.

(Weighing of eligible stock is not charged for, as this is done for guarantee purposes.)

Grading and weighing of carcasses not eligible for the guarantee

Cattle	1s. 6d.
Calves	6d.
Sheep	4d.
Pigs	6d.

(Included in the second category are bulls, ewes and rams, sows and boars, etc.)

THE GRADE AND DEADWEIGHT WAY

How Carcasses are Graded There are two types of carcass grading. That used for bacon pigs requires an instrument which shows at a glance the maximum fat measurements at certain points on the back which are related to the various grades, thus enabling the grader to determine the proper grade of the carcass. There is no instrument suitable for other types of carcass and grading must be done by visual appraisal of the factors and the various combinations of these factors which govern determination of grade—that is, conformation, finish and quality, or, in other words, the commercial value and quality of the meat.

The conformation, or perhaps what one might term the structure of the carcass, is an important point. Choice or dearer cuts of the hind-quarter must predominate in a good carcass, since that is what a retail butcher looks for when making his purchases. Unfortunately, since carcasses are a product of nature, they do not conform to an exact pattern and they vary in their relative development of the three main factors mentioned above.

A carcass might lack one of the qualities but nevertheless could be placed in a particular grade because that deficiency is offset elsewhere: for instance, a carcass of a young steer or heifer might lack finish but, being of good conformation, any deficiency of finish (and therefore of palatability) is made up because it is young and its meat will be tender.

It is the function of the grader, therefore, to decide into which grade a carcass should be placed by assessing the various combinations of the various wholesale cuts, the proportion of fat, lean and bone and the general quality of the meat.

What the Farmer should Produce It has been evident over a number of years that there is a consumer aversion to fat meat, not only in this country but overseas. The modern cry is for lean, tender meat. The consuming public appears to prefer tenderness to the palatability of the meat from the fatter and more mature animal.

Gone are the days of the large family week-end joint, and size is therefore another factor in present-day economy. Although there is still a demand from hotels and restaurants for joints from the heavier and more mature animal, the ideal beef animal is a steer or heifer of good conformation about two to two-and-a-half years old, adequately finished but not over-fat. It should be short in the leg, fine of bone and the hind-quarters should be heavier than the fore-quarters, thus giving a greater proportion of the higher priced cuts.

Lightweight lambs of good quality, but not over-fat (up to, say, 36 or perhaps 40 lb) are the most popular. They must be of good length, breadth and thickness, short in the legs and well fleshed in the hind-quarters.

Preferences vary in different parts of the country as to the most popular weights for pork pigs; but, on the whole, carcasses of from 4 score to 5 score 10 lb appear to be in greatest demand. Carcasses with good length of loin, well-fleshed hams, light shoulders, and which are not over-fat in relation to weight, meet the popular demand.

At many of the agricultural shows, including the Royal, the Ministry has staged demonstrations of good and bad carcasses and joints. Both farmers and housewives have found these demonstrations of great value. It is of fundamental importance that producers of livestock must be fully aware of "consumer preference", and the weekly display in the butcher's shop is well worth watching.

AGRICULTURAL SCIENCE AT SHEFFIELD

G. V. JACKS, M.A., B.Sc.

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The 1956 meeting of the British Association for the Advancement of Science was held at Sheffield on August 29–September 5. The President of the Agriculture section, Mr. Jacks, reviews some of the aspects of farm science which were discussed there.

SHEFFIELD, as the venue of the British Association meeting this year, could hardly have been less agricultural. Nevertheless, there were very good attendances and keen discussions at the meetings of the Agriculture section which, with the thirteen other sections, benefited to the full from the excellence of the local arrangements for the meeting and the generous hospitality given by the city of Sheffield. Members of the Association should also be grateful that on only one day of the meeting was the weather really typical of the summer of 1956.

The programme of the Agriculture section included four paper-reading sessions and five excursions. In this article I shall be concerned with the proceedings at the sessions, but an account of the activities of the section would be incomplete without reference to the most interesting and enjoyable visits to Mr. Elliot's and Mr. Dalton's farms in the Hope Valley, to Stockbridge House Experimental Horticulture Station and Gleadthorpe Experimental Husbandry Farm, to some opencast coal sites of the National Coal Board, to the British Oil and Cake Mills at Selby, and to the factory of the International Harvester Company at Doncaster.

The sectional proceedings started with my Presidential Address on the influence of man on soil fertility. When man first practises settled agriculture in any region he invariably exhausts the soil; he cannot help himself because the soil is almost the only source of his livelihood and he has to use up soil fertility in order to live. Special social systems are evolved to check a too precipitate fall in fertility. This was done in England by the compulsory fallow in the three-field system of medieval agriculture and is being achieved at the present time in the various forms of soil conservation districts, widely used in America, Australia and Africa, in which the maintenance of soil fertility is enforced by local laws and ordinances comparable to the manorial rules which governed agricultural practice in England.

At a later stage of social evolution man tends to congregate in towns and to abandon agriculture for the more profitable pursuits of commerce and industry. The wealth produced in the towns increases not only the demand for the produce of the soil, but also the price which townspeople are able to pay for it, so that it becomes profitable for farmers to invest their money in soil fertility to satisfy the growing demands of the towns. Most of the present high fertility of British and western European soil derives from urban wealth.

But the first effect on soil of the growth of towns is to decrease soil fertility by increasing the demand for food without providing the farming community with the wealth with which to fertilize the soil. Many young countries are passing through this stage now, and are suffering severe soil exhaustion and erosion as a consequence; but in some, such as the United States, the wealth of the towns is beginning to flow back into the soil and soil fertility and crop yields are rising. Paradoxically, there is nothing like

industrialization for increasing soil fertility, and I suggested that there is no foreseeable limit to the number of people the world can feed provided most of them live in towns and create non-agricultural wealth.

Tropical Agricultural Science Two papers (by MR. H. J. PAGE and MR. G. WILLIAMSON, both with wide tropical experience) on crops and animals, respectively, stressed the difficulties of introducing scientific methods of farming to backward peoples. Mr. Page was concerned with the use of fertilizers by peasant farmers, particularly in India. In the humid tropics, at least, lack of plant food is the main limiting factor for improved crop production. Throughout tropical Asia and Africa the use of fertilizers by peasant cultivators is at present negligible. But in India, where industrialization is beginning, the peasants are gradually learning the value of fertilizers. At present, poverty is the main deterrent to fertilizer use. The average yield of rice in India is 800-900 lb per acre, compared with 6,000 lb in Spain. Experiments have shown that, on the average, 1 lb of nitrogen will produce 15 lb of rice on Indian soils. But peasants are not impressed by the results of government experiments, and a scheme is now in hand to get them to carry out small and simple demonstration trials of fertilizers on their own land. In Bihar alone, 13,500 such trials are being carried out this year, and the results have been so dramatic that the peasants are vying with each other for the privilege of making a trial. There seems every reason to expect that these simple demonstrations will lead to a bigger increase in food production than would the accurate knowledge of Indian soil requirements that could be gained from complex experiments. But the economic problem would remain.

Mr. Williamson drew attention to some of the difficulties of introducing high-yielding livestock breeds accustomed to temperate climates into tropical countries where productivity of livestock is usually low, and when the genetic potentials of indigenous breeds have often been suppressed by inadequate feeding, disease or faulty management. Increased productivity could most easily be achieved by removing these limiting factors. Attempts to introduce temperate breeds have often failed because it has not been realized that animals, like plants, can generally only be transplanted to regions with similar climates. At present, measures aimed at altering the conditions of husbandry so that the potentialities of present stock can be realized offer the best prospect of advancement. Such undertakings as the sinking of wells and construction of dams to induce nomads to settle, the proper conservation of fodder to eliminate annual periods of starvation, the prevention of epidemics, and the organization of markets and abattoirs to take off surplus stock will produce results where even simple breeding plans which require some consistency of application and a degree of comprehension fail to make progress.

Agricultural Ecology Three papers were given on the effects of agriculture on the balance of nature. MR. E. M. NICHOLSON (Director-General of the Nature Conservancy) described how ecological research is promoting better farming by showing how the farmer could co-operate with nature to their mutual advantage by more efficient soil conservation, water utilization and control of animal populations. The aim of the agriculturist should be to increase the natural "capital" of his land, and thus increase the income therefrom in the form of crops, stock and water. Management of forest land is of importance in the conservation of natural resources, since forests have a great influence on the water supply of a region, and the nature of the trees affects the potential fertility of the soil. Human interference with pest ecology sometimes recoils on the interferer,

and a very careful study of nature is necessary if farmers and foresters are to be assured of her assistance rather than her hostility. Mr. Nicholson deprecated too much reliance on chemical and mechanical short cuts.

DR. I. THOMAS (Ministry of Agriculture) spoke on the control of animal pests and pointed out that the wood pigeon was now taking the place of the rabbit as the farmer's greatest vertebrate pest. Pre-myxomatosis losses from rabbits had been estimated at £45-60 million. Trapping of rabbits used to kill large numbers of their predators, including foxes, and the disappearance of rabbits has not appreciably affected the numbers of foxes or their depredations. Wood pigeons, on the other hand, have tended to increase, owing partly to higher acreages under brassicas and peas and the difficulties sometimes encountered of controlling wood pigeons on these crops without at the same time killing pheasants. He said that whether pheasants were regarded as vermin depended on whether the prime objective was growing crops or preserving game.

MR. A. H. STRICKLAND (Ministry of Agriculture) described how competition, climate and natural enemies control the densities at which insects are in balance with their environment. The importance of these controls needs to be assessed before public funds are expended on artificial controls. Thus, of the £1 million annual loss to Brussels sprout growers caused by the Cabbage aphid, not more than half could be recovered by extensive insecticidal treatment. Frit fly causes annual losses to oats of about £10 million, but most of these losses are caused by small infestations which farmers would not observe or consider worth the expense of control. It is unlikely that pest densities will ever be permanently reduced by insecticides, because these do not affect the natural rate of increase of the insects.

Animal Nutrition Mr. G. E. LAMMING (School of Agriculture, Nottingham University) gave an account of the recent discovery that antibiotics added to feeds increase the growth rate of young animals and poultry. Addition of certain hormones to the rations of fattening sheep and cattle also causes the animals to put on more flesh, mainly lean meat. The reason for these effects is not known, the most popular theory being that antibiotics suppress growth-depressing micro-organisms, allowing the animal to grow faster on a given amount of food. Other workers believe that antibiotics have a direct effect on the animal body. There are no signs at present that animals fed with antibiotics develop sensitivity to later therapeutic doses of the antibiotic, though there is a danger of the development of antibiotic-resistant strains of bacteria. Remarkable results have been obtained in America with stilboestrol. In one test, steers fed on a pennyworth (10 mg) of stilboestrol per day made a 15 per cent extra average daily gain in weight, and reached a finished condition earlier. Treatment to pigs has been less successful. These preliminary results hold promise that considerable savings could be made in feed and labour costs by this use of antibiotics.

MR. D. S. MACLUSKY and MR. R. C. CAMPLING (Hannah Dairy Research Institute) gave two papers on the role of grass and methods of grazing in dairy herd management. Mr. MacLusky said that today there is greater scope for increasing profits by reducing production costs than by raising milk yields. A better return may be achieved by raising stocking intensity than by raising yields per cow. There should be a reduction in the acreage required for pasture, and an increase in the amount and an improvement in the quality of grass conserved. Good quality grass can appreciably reduce dependence on concentrates. Stock-carrying capacity can be increased by the rational use of fertilizers, by irrigation and by the close-folding method

of grazing, in which alternate resting and defoliation invigorate the growth of the herbage.

Mr. Campling described an experiment on the effects on output of three grazing systems; strip-grazing of an intensely fertilized grass sward; continuous grazing of a similar sward receiving an equal quantity of fertilizer; continuous grazing of a grass-and-clover sward receiving a single application of phosphate and potash only. The intensively fertilized swards, which received the equivalent of 13½ cwt per acre of "Nitro-Chalk" with P and K, produced 60 per cent more cow-days per acre than the grass and clover sward receiving little fertilizer. A comparison between strip-grazing and continuous grazing on intensively fertilized swards showed a 10 per cent increase in cow-days per acre from strip-grazing. The method of grazing management and intensive use of nitrogen had little influence on production per cow. There was, however, a slightly higher content of solids-not-fat in the milk of the cows on the grass and clover sward. The results thus confirm that intensive use of nitrogen with adequate minerals and strip-grazing management will lead to a substantial increase in stock-carrying capacity without any marked effect on production per cow.

Mechanization In the last session, on future prospects in agricultural engineering, MR. D. R. BOMFORD, a well-known Worcestershire farmer, discussed the difficulties of further mechanization. The task of the agricultural engineer is to make it possible for fewer men to produce more food, but it is becoming difficult to advance as rapidly as in the past, because every time a farm job is mechanized there is one less unmechanized job to tackle. Other difficulties—especially on small farms—are the high cost of mechanization and of the wages required to keep efficient mechanics on the land. A pre-requisite for any substantial advance in agricultural engineering is increased facilities for technical training. Mr. Bomford foresaw the possibility of developing a new range of machines, starting with ploughs which do not need drivers to control them.

MR. A. W. CAPPS (Heat Husbandry, Ltd.) described his pioneering proposals for applying the heat and energy of the atmosphere to the working of a small dairy farm. The proposals comprise a special compressor, a vacuum-type grass drier (which also cools the home and cow byre), and an inter-seasonal heat store, which utilizes the subsoil to retain heat accumulated from grass drying for winter heating. Methane from farmyard manure augments power in calm weather. Stall feeding throughout the year, irrigation and the very small size of the farm ensure maximum yield per acre. It is claimed that thereby fuel costs are eliminated and optimum food production and living standards are obtained. Mr. Capps argued that the high living standards required to attract people back to the countryside can best be procured by heat-husbandry techniques.

MR. H. J. HAMBLIN (National Institute of Agricultural Engineering) discussed the probable future evolution of the tractor. He prophesied its ultimate adaptation to harvesting machinery, but the most likely lines of development in the immediate future are, he thought, in increasing the comfort and convenience of the operator, for example, by a cab pressurized with filtered air, and by using a different type of power transmission. Of the possible alternatives, a hydraulic transmission of the hydrostatic type has much to commend it. A short film was shown illustrating the great manoeuvrability of a prototype produced at the N.I.A.E. It is unlikely that economy would be obtained by enlarging the power unit much beyond that now used. Mr. Hamblin agreed with Mr. Bomford that the farmer's future requirement would be a machine that would direct and control itself.

THE DWARF PYRAMID APPLE TREE

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The dwarf pyramid apple has been much discussed by some disappointed growers since it was introduced nearly thirty years ago. Here, one of the pioneers of its culture discusses the main reasons why the system occasionally fails.

GARDENERS and others interested in fruit-growing have for many years tried to induce early bearing in apple and pear trees and, at the same time, limit the size and control the vigour of the tree. Such trees growing under normal conditions in Britain often reach 20-30 feet in height and spread. This alone causes complications in management compared with most other crops, which can be handled by workers at ground level. Furthermore, the trees do not yield significant crops until 8-10 years after planting, and are not fully matured until they are 16-20 years old. Our patient forefathers were well aware of this and gave much thought for many years to contriving a means of controlling vigour in the tree, with the knowledge that such vigour control would in turn bring earlier fruiting.

Various ideas directed towards intensive methods of cultivation were put into practice in France and Belgium more than a century ago, including selections of dwarfing rootstocks upon which trees were grafted, and various ways of training and of summer pruning. The "cordon" tree was developed, and there were several others which were expected to conform in size and shape to predetermined requirements. In all such tree forms, the overriding requisite was the same—the control of vigour. Some of these new tree forms found their way into English gardens, and, indeed, espaliers and cordons are still being grown in this country today. Cordons were introduced into commercial orchards in the early part of this century, although only very small areas were planted with them because of the expense of providing tree support, as well as the cost of the large numbers of trees required per acre.

As the years passed, the demand for small trees became even more persistent. In the late 'twenties, at Brockley in North Somerset, Mr. A. H. Lees developed and planted several acres of trees of controlled form, upon which he was developing his own improvements on the French *fuseau* form. His experiments were based on the cordon, but with a strong central stem which would not need support and which produced longer laterals for fruiting.

Developments at Cannington In 1928, Mr. A. D. Turner and I were considering extensions to the demonstration fruit plantations at the Somerset Farm Institute at Cannington, nr. Bridgwater, and were looking for methods to demonstrate quickly the influence on fruit quality of various cultivation factors. It was decided to plant out maiden trees, which would always be controlled in their vigour. They eventually developed into small compact trees of pyramid shape, reaching 8 feet in height and 3 feet in diameter. These dimensions were the prerequisite for a tree which could be handled entirely from the ground and, by restricting the vigour in this way, it was expected that the other requirement

of early fruiting would be induced. Another essential was a central stem sturdy enough to maintain the upright position of the tree with a full load of fruit.

As well as finding out whether this new dwarf tree would be a commercial proposition, we wished to know the effect upon fruit quality in the young tree of such factors as rootstock influence, summer and winter pruning, grassing down, various grass mixtures, and differing nutrition. Biennial bearing was another problem which we hoped to study.

Trials to investigate these points were eventually laid down in 1929, and details of these early trials—which were of necessity on a moderate scale—were later published. The main results which need to be mentioned here were:

(a) that the method of fruit tree development proved to be commercially possible;
(b) that early fruiting was induced and, what was more important, early fruit quality was achieved;
(c) that most of the cultivation factors included in the trial (pruning, grassing, nutrition and rootstock) had considerable influence on fruit quality;
(d) that a lot more investigation was needed into fruit quality, as well as into the new method of tree development.

After this work, other plantings were made to test further points and, since the Institute was a demonstration centre, visiting fruit-growers, prospective planters and nurserymen from all over England soon became interested, many making annual visits to see developments of the system during the 1930s. At that time, fruit-growing was fast spreading in Essex, and many prospective planters, both there and elsewhere, thought that the system of growing held out prospects of earlier returns than from the orthodox bush tree, which needed several years to produce sound quality fruit. Many of these planters were new to fruit-growing and wanted to build up small fruit farms with early returns.

Basic Factors for Success Many heated arguments are based on experience of these dwarf pyramid plantations started just before or after the last war. The method has been widely described, recommended and condemned—often, I fear, by people with comparatively little experience of the system in its true sense, or, indeed, understanding of its basic principles. There have certainly been some failures, but before suggesting possible reasons for these, I should like to consider the essential factors of success in the growing of these trees, for many dwarf pyramid apple plantations have been doomed from the start because these fundamental principles have been ignored.

The first, and probably the greatest need of the prospective planter of pyramid apples is to have a thorough knowledge of the principles of the system and to apply these with a good deal of commonsense. He must also have the right objective—namely, to produce high-quality fruit from a limited area of land—since the system is only suitable for intensive methods. Thus high quality production as well as early fruiting is essential. Secondly, he must have enough labour available at the right time to ensure that the trees never get out of control.

The other considerations are concerned with choice of the land. Because of the high outlay, the site must be carefully selected. Frost areas or land that is excessively exposed should be avoided. Rainfall should be moderate (25-35 inches). If below 25 inches, irrigation will be necessary because of the dense tree population; if above 35 inches, there is danger of canker and scab. Finally, and most important, there is the soil itself. Since excessive tree vigour must be avoided, very fertile soils are unsuitable. In the west of England, open, sandy soils of good depths have proved by far the most

successful. Roots can penetrate such soils for water, and fertility can be controlled.

In my opinion, these are the basic needs for success with dwarf pyramids—to be weighed in the balance before the grower even thinks of buying his trees. Assuming they have been met, what, now, are the main essentials in planting and developing the orchard?

Establishment A grower naturally wants to choose the highest quality dessert apple. Cox's Orange Pippin fits the bill, not only in the matter of quality, but also by reason of its growth characteristics. A variety which naturally tends to horizontal laterals, which readily produces spurs and dards, and furnishes its young wood fully, is always desirable. It is not so easy to provide a pollinating variety for Cox's. Lord Lambourne is probably the most satisfactory at present: it has most of the necessary attributes, including regular flowering and steady growth, and has strong claims to being a pyramid apple variety in its own right. More than one pollinator is often desirable; at the moment, Worcester Pearmain would be the second choice. Although not apparently suitable for pyramids, this variety has responded well, giving reliable crops of very high colour. These three probably form the extent of choice amongst the older varieties; some of the more recent introductions may eventually be recommended with confidence.

Rootstocks are also very important, but we appear just now to be in the midst of a change from old to new. Little is yet known of the value of the Malling-Merton M.M. series for pyramids, and most of the available information concerns Malling Nas. II and VII. For most purposes, it is advisable to select a stock with a fair number of anchor roots for stability and penetration of the lower soil layers. Selection would naturally depend a good deal on the soil, but stocks of low to medium vigour should be used, and, preferably, those which induce horizontal branching in a young tree.

Early plantings were all made in 6-7 feet rows, the trees being 3 feet apart in the row. The introduction of more machinery has resulted in the distance between rows being extended to 8-9 feet, according to the machines used. But the distance between trees should not exceed 4 feet, otherwise the control of vigour through root competition will be lost.

The arrangement of pollinators can vary, provided enough are available. At the moment, an alternating pollinating variety for every fifth row of trees is usual. Another method is to plant a pollinator at every eighth tree in a row, but to stagger their positions in adjoining rows. Both these methods are better than the early arrangement of a pollinator at every third tree in every third row.

Management Correct treatment of the young tree is very important to get suitable branch formation for carrying full crops. Planting should be done as a one-year-old and the maiden cut down to 2 feet to make a suitable first break of lateral branches. The annual extension of the leader must be carefully maintained in a perpendicular direction and regulated to about 15 inches, so that each successive tier of fruiting laterals arises regularly at about this spacing. Very irregular laterals can waste air space on a dwarf tree and cause poor balance. The annual development of young fruiting laterals should be carefully controlled to encourage fruiting from the main stem outward with a minimum of bare wood. Later development will follow similar lines, but vigour will be reduced as fruiting develops and root competition becomes more severe. When the tree reaches the desired size, any excess vigour should have been fully controlled, and regulation of

tree size and habit by pruning should not cause excessive re-invigoration. Throughout the formation of the tree, it is of the utmost importance to control the development of laterals into a near horizontal position.

Grassing down is always necessary with dwarf pyramids, and the seed should be sown when the young trees are satisfactorily established. Some think it desirable to hold grass as a trump card against excessive vigour, but this is unsound reasoning if all the other methods of control have been used correctly. The type of grass is not very important, provided it makes a close sward; for example timothy or meadow grass. Where excessive vigour is to be controlled for a time, ryegrass may be an advantage. As in all fruit plantations, the grass should be mown regularly; unfortunately, inter-tree mowing still provides a difficult minor problem.

The ability to control vigour in the tree is probably the greatest essential of the system. Vigour is often predetermined to a very large extent by the soil chosen. Variety and rootstock are other influences. After this, the main "tools" left in the hands of the grower for reducing vigour are grassing down, carefully controlled manuring, summer pruning, modification of winter pruning, bark ringing, and the inducement of early cropping, which, in itself, is a most satisfactory way of reducing vigour. Each of these "tools" could be explained and discussed at some length, but regrettably space does not permit this. Suffice it to say that winter pruning can be modified in its several ways, but chief modification is where annual growths are "tied down" to form additional potential fruit buds, instead of being removed completely.

Normal pest and disease spray programmes for apples and pears can always be applied to dwarf pyramid trees. Further experience with very low-volume spraying on pyramids is necessary before comment can be made, particularly as there is more danger from drift where the rows are close to each other and "build-up" application might occur. However, most modern growers of pyramids have small acreages, and high-volume spraying does not present great difficulties.

Causes of Failure Undoubtedly the most common cause of the system breaking down is excessive vigour. If the grower eventually thins out to produce larger trees he has failed in his initial purpose—a controlled orchard to be handled from the ground and producing fruit of exceptional quality. Such excessive vigour is usually due in the first place to the soil being inherently too fertile, but it can also often arise from insufficient use of "control tools". Where the soil is very fertile and exceptional measures would have to be taken to control growth sufficiently, it might eventually be wiser to thin out alternate rows and leave dwarf hedges at wider spacing. It is important to maintain tree population in the rows. As a final resort, and only if the system has seriously broken down, should the grower thin out the plantation fully and allow the remaining trees to gain full bush size.

Summer pruning is often omitted in the pyramid orchard because of ignorance of its purpose, which is to control excessive vigour and, often in dry spells, to help the tree by a regulation of its leaf area. Again, many think that summer pruning demands a lot of skilled labour, but this need not be so; if the right methods are followed, pruning can be done quickly by relatively unskilled hands.

Bad pruning of the laterals is a frequent cause of failure in an apparently well-established orchard. Too great a length of lateral growth left each winter will mean, after 8-10 years, long laterals fruiting only at the perimeter.

Another contributing factor to bare laterals can be the prevention of light penetration by leaving too many laterals. Where there are plenty of laterals, it is advisable to shorten some from time to time and rebuild new fruit spurs and dards.

Some growers have complained of losing the lower branches of their pyramids. In the past, this has often been caused by the rows being too close together, but, with 8-9 feet planting, it should not occur unless the higher part of the tree is allowed to become too vigorous. Efforts should be made in management to retain a pyramidical tree or, at worst, a cylinder shape. If the pyramid eventually becomes inverted, the system has broken down.

Since the tree is relatively low, the risk of frost damage is probably greater than with bush and standard trees. It is therefore important that the site should be as free from frost as possible. If there is a frost risk, serious thought should be given to protection. After all, the area to be heated is usually small, but crop value is high.

On open soils where vigour can be controlled, water is often required in a dry spell when crops are heavy. Irrigation of light sand or gravelly soil is well worth while.

The Grower's Goal Much thought and attention has been given over the years to the correct application of dwarf pyramid growing and, to a large extent, the original basic principles laid down nearly thirty years ago still hold good. Admittedly, the system requires a good deal of care, as well as the basic knowledge and skill needed for apple-growing today. But, as with any challenge, it brings its own compensation. The reward of success is a very high-quality dessert apple produced early in the life of the tree which will not become much larger as the grower becomes less inclined to climb about its branches.

QUEST FOR THE GOLDEN PLOUGH

E. St. J. Height

Ye rigid Ploughman! Bear in mind
Your labour is, for future hours.

Richard Hengist Horne
1803-84

ONCE the fundamental character of the ploughman's occupation is recognized, it will be seen that neither the importance of his task nor his outlook upon it has changed much in two thousand years. The plough is still the key to the earth's fertility and ploughing the first of all cultivations. It was so when the Old Testament was being written and before the ancient Egyptians recorded the use of the plough on their monuments. To grow good crops, to control the land properly, and to master the growth of weeds, good ploughing is essential and, to do the job well, demands a high degree of skill.

Competition seldom fails to stimulate craftsmanship and skill, and to improve standards. It is not surprising, therefore, that ploughing matches have been a part of country life for a very long time. The tradition is strong, though few records exist. Yet from time to time the discovery of an old hand-bill, or the sparkle of an old man's store of tales told by his grandfather, show that ploughmen matched their skill against one another more than two hundred years ago.

In those days and until comparatively recent times, the ploughman, who knew from experience just how a plough should be set and the mould-board shaped, worked in harmony with the blacksmith plough-maker who fashioned his plough so that it would properly turn the furrow on the lands nearby. And, when the blacksmith's job was done, the well-trained horses knew how to pull a fine-set plough steadily and how to pull out and turn in at the headlands so surely that the least physical effort was required of the ploughman who had taught them their job.

Then, quite quickly, a new skill was required in place of the old. Labour drifted from the land into the restless sea of industry, men good with horses became hard to find. The tractor displaced the horse as motive power on the farm. To grow more food, more land had to be put under the plough and more ploughmen were needed to man the tractors with their multi-furrowed ploughs.

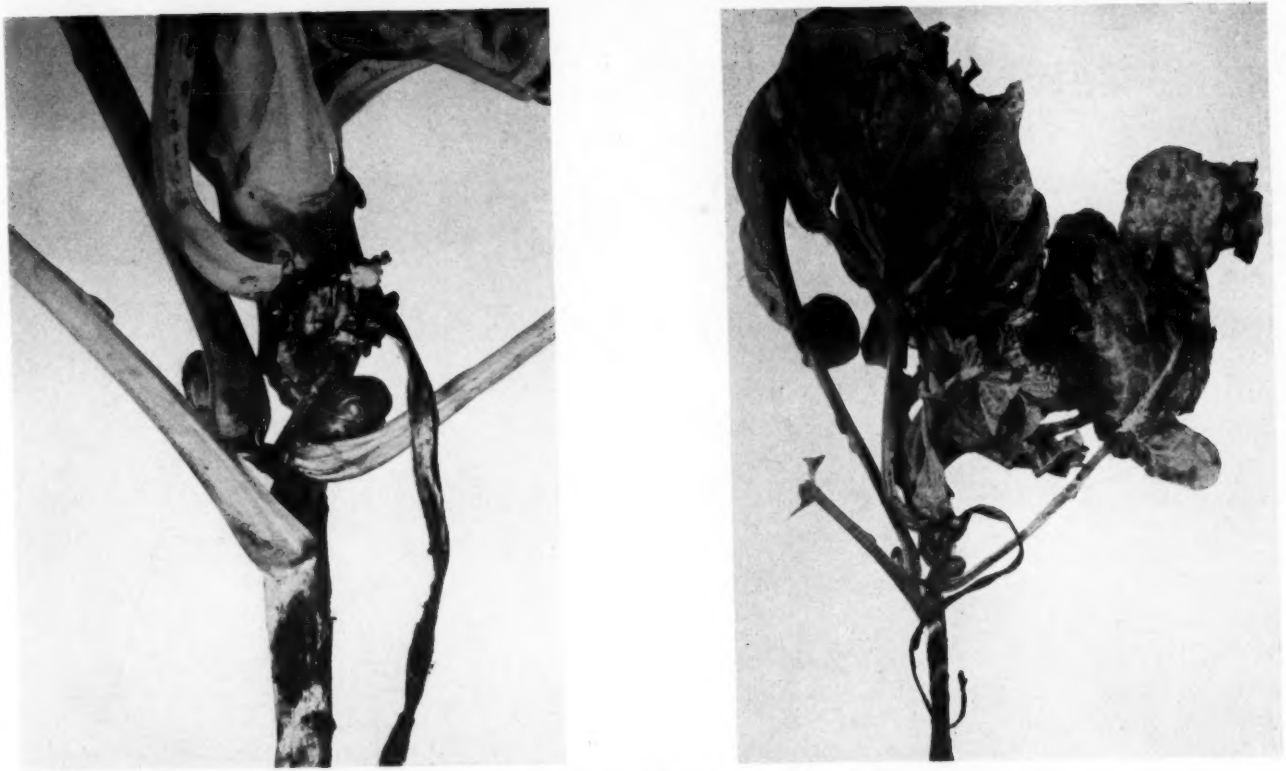
The men came forward and quickly learned to drive tractors. But most of them had little, if any, experience with the plough. Ploughing became a rough job and, while the respective merits of horse and tractor were hotly debated, it seemed that the old craftsmanship might disappear.

Yet ploughing contests went on, not only in this country but in many distant lands. Local and national associations were formed and, far from the profession of ploughman declining to that of a push-button custodian of machinery, the old skill has been re-developed and applied to the new tools.

In 1953, the World Ploughing Organization was formed, and in all its member countries local annual ploughing matches were held to discover the ploughmen who qualified for local and, eventually, national championships. These had before them the ultimate goal of the World Championship. In the same year, the first World Ploughing Contest was held in Canada—at Cobourg, Ontario.

Each year since then, a world contest has been held in a different country. The participating countries' national ploughing organizations are responsible

Across the world to plough half an acre. Mr. J. C. Brooker of Canterbury, New Zealand, tries for the Golden Plough at Shillingford.



Damage to Crops by Lightning (Article on pp. 387-9)

Brussels sprouts, showing scorched edges of leaves and shrunken mid-rib and leaf-stalk.

The "Soft Roof" Pole Barn (Article on pp. 383-6)

A simple construction by farm labour with inexpensive materials. Suitable for lambing pens, calves, pigs and deep-litter poultry.

Turkey Meat All the Year Round (Article on pp. 380-2)

Photos: *Ralph Tuck*

Beltsville White turkeys in a Suffolk Packing Station. After killing and bleeding, the birds pass along on an overhead conveyor to a thermostatically controlled scalding tank.

Evisceration, immediately before wrapping and quick-freezing.

for the competitive selection of two national champions to represent them in the world contest. This year, Britain was chosen as the meeting place, and at Shillingford, Oxford, twenty-five champions from thirteen countries came in quest of the Golden Plough trophy and set their strikes at the medium loam of the broad lands of Shillingford Farm on October 11 and 12.

The contest was limited to tractor two-furrow mould-board ploughs fitted with skimmers. Each competitor was required to plough one plot of stubble land and one plot of grassland, each measuring about half an acre. The time allowed for each plot was three hours, and the judges assessed the quality of the ploughing on the crown, the seedbed, the burying of grass or stubble, the finish (comprising the last three rounds and the sole furrow), and on firmness and appearance. Only one tractor wheelmark was allowed for on the cast-off.

In stubble ploughing, the rules compel competitors to make an opening split at the "setting out". The strip must be well cut through, so that no land is left unturned in the middle of the ridge. First, a split must be made in which the marking furrow is turned out; then, in the reverse direction, the rippling must be gathered to the centre to ensure that all land is cut. In ploughing grassland, competitors could choose either to make a "gather" or draw a split when making the opening. In general, the aim in the ley ploughing was a furrow neatly set up in an unbroken slice, high enough to stand during the winter, and presenting enough soil for the harrows to make a good seedbed or tilth.

A red Verey light soared into the sky. Watched by the critical eyes of thousands of spectators, some on moving trailer "grandstands" drawn by the ubiquitous tractor, competitors set their shares into the soil. After completing the crown, which consisted of six rounds with a ten-inch plough (or five with a twelve-inch), they then began to throw out. There were, therefore, twelve or ten heavy furrows, according to the plough used, gathered on either side, the "finish" comprising the last three rounds and the sole furrow. Stubble plots were ploughed on the first day and a one-year ley on the day afterwards.

At the end of the second day's ploughing, MR. HUGH BARR of Coleraine, Northern Ireland, no doubt stimulated by the southern sunshine and the presence of a nearby stand of "ten gallon" hats worn by North American visitors, made assurance trebly sure by retaining the championship and the Golden Plough which he had won for the past two years. He finished with 165.75 points out of a possible 200. A Norwegian, MR. ARNE BRAUT, aged 20, was second with 154.9. The third place was taken by last year's British high cut champion, MR. E. J. WALKER of Flax Bourton, Somerset, with 152.65 points.

Here was superb ploughing—a display of skill to confound the few critics who fail to find such competitions interesting now that the days of horse-and-man ploughing have largely gone. The avowed object of the World Ploughing Organization and its contests is to promote better understanding of soil cultivations and to give ploughmen all over the world a chance to look beyond the native horizons and to exercise their skill on distant soils. This it surely cannot fail to do. At the end of the day at Shillingford, H.R.H. the Duke of Gloucester unveiled a commemorative cairn built of Oxfordshire flint and of stones from every competing country. As he did so, one felt that "Peace through the Plough" could not be a vain hope when so many men of different nations can meet on common ground and establish links of friendship forged by a love of their craft.

TURKEY MEAT ALL THE YEAR ROUND

RALPH TUCK

We must overhaul our present breeding and marketing methods, suggests Mr. Tuck, if we are to emulate the Americans and develop an all-year-round demand for turkey meat.

POULTRYMEN engaged in the hatching, rearing and fattening of turkeys have received a reasonable return for their enterprise since the war. On the whole, selling prices have been fairly stable, and the natural outcome of this has been that more and more farmers and smallholders have been attracted to the idea of rearing turkeys, while many others have increased the size of their flocks considerably. These facts are reflected in the current poultry figures. In June 1955, there were 1,200,000 turkeys of all ages in England and Wales. In June this year, the provisional figures gave the turkey population as 1,985,000—an increase of 66 per cent. The vast majority of turkeys marketed in this country, following traditional practice, are sold at Christmas. But there is obviously a limit to this seasonal market, and if the industry is to continue to expand and prosper other outlets must be found. Alive to this danger, the British Turkey Federation has for some time been conducting a vigorous campaign designed to popularize the turkey as an all-the-year-round dish. But publicity alone will not provide the solution. There are many problems for all engaged in the industry, whether breeding, rearing, fattening, or marketing, if the British housewife is to be converted to buying turkey meat throughout the year.

During the past few years, there has been a tendency for the size of birds marketed to get larger. Improvement in the strain of various breeds and better foods, giving higher food conversion figures and quicker growth, have been contributory factors. On the whole, too, it has paid the producer to market a large bird. The Christmas trade, with the consumer asking for a festive dish for a family gathering, has been able to cope with birds in the 15-20 lb weight range when killed. Out of season, the shipping lines and hotels have taken the bigger birds. But when the public are asked to consider eating turkey instead of the family joint at the weekend, the high cost of a large bird is an obvious deterrent.

Market for the Smaller Bird There are three solutions to this problem. The first is to sell turkey joints or cuts. This is primarily a problem for those engaged in marketing, and we will deal with it later. The other two solutions, which concern the turkey producer, are the marketing of a young, immature turkey of 8-12 lb live weight, or the breeding of turkeys which mature at these weights, such as the Beltsville White. The ideal solution probably lies in a combination of these two factors, the first as a short-term answer and the second as a permanent feature.

Criticism has been levelled at the marketing of immature birds, because they contain a higher proportion of bone to flesh than the older birds. It is also claimed that because the bird is still growing it is impossible to get a good, marketable finish. The breast tends to be high and lacks the fat deposit to give it a good colour. The stabilized fats, now attracting the interest of feed manufacturers in this country, will probably help solve this problem. The part of the stabilized fat which is not used to provide energy is deposited on the carcass. Consequently, immature birds fed on such a diet have a better finish.

Economically, the smaller, immature turkey is not such an attractive proposition, since it costs more to produce per lb live weight than the fully-grown bird. The expensive first few weeks of rearing from the day-old stage represent a higher relative proportion of its growing life. Feed, too, is dearer, because the younger bird must have a high protein food, and has to be marketed without the customary weeks of feeding on a low protein diet. From these facts, it does appear that the better prospect lies in the breeding of smaller birds maturing naturally at the lower weights. Many breeders are, in fact, showing increasing interest in the breeding of smaller birds.

There is another important factor which breeders must bear in mind. The larger birds have the attractive broad breast: examples are the Broad-breasted Bronze and the Broad-breasted White. Apart from the fact that the heavier breasted bird is very attractive in appearance and lends itself to attractive packaging and display, these strains give a higher proportion of edible meat in relation to carcass weight. In this respect, the turkey beats all other types of poultry. Even an immature 7 lb turkey compares favourably with a chicken of similar weight in relation to the percentage of meat on the carcass. The main weakness of the Beltsville White turkey, as compared with the larger breeds, lies, therefore, in its inferior breast and, consequently, its lack of sales appeal. This is a problem that deserves the attention of the breeders.

Attractive Presentation Pays There are very definite changes taking place in the methods of marketing turkeys, and these seem certain to become more pronounced as the demand for an all-the-year-round supply grows. Packers are becoming increasingly aware that attractive presentation and packaging are essential, if the interest of the housewife is to be caught and held. Canning, quick-freezing, vacuum packing and cooking, are all being used as processing mediums. The importance of uniform grading is now fully appreciated by the packers, and they are co-operating with the producers to an ever-increasing extent. The traditional marketing of turkeys through markets, wholesalers and butchers' shops is giving place to the selling of processed turkeys by packers direct to provision merchants and self-service markets. Many provision merchants and stores have found that the public are showing an interest in turkey joints, both cooked and uncooked. If this demand grows it will provide an outlet for the larger bird.

The keenest interest seems to be shown in quick-freezing. This medium has many points in its favour. Not only does it enable a highly perishable article to be turned into one that will keep indefinitely, it also lends itself to attractive packaging and display. The development of hygienic plastic wrappers, enabling eviscerated birds to be vacuum-sealed before freezing, has meant that quick-frozen turkeys can now be kept in cold store for long periods, with little or no loss of quality and taste. The smaller and medium-sized birds are more economical to quick-freeze, although larger birds are being processed in this way.

Sales Boom in the U.S.A. At this stage it is interesting to compare developments in this country with those in the United States, to which passing reference has already been made. It has been estimated that the annual consumption of poultry meat in the U.S.A. is five birds per person. In this country, we consume only one bird for about every thirty-five people. Again, the present U.S. turkey population is 76 millions—some thirty-eight times larger than ours. Thus it is hardly surprising to find that in their methods of presentation and marketing they are

far ahead of us. Nevertheless, it is significant that we are following the same broad pattern as the American industry.

In America, turkey has become firmly established as an all-the-year-round dish. The demand is, however, not for turkey alone, but for all kinds of poultry. There are many packing stations capable of handling several thousand birds an hour. After killing and bleeding, the birds pass on overhead conveyors to a scalding-tank, where they are sprayed or immersed in hot water, the temperature of which is thermostatically controlled at 120°F. Still on the conveyor, the birds then pass to automatic pluckers, which consist of revolving drums to which rubber fingers are fixed. Semi-automatic machines deal with the tail and wing feathers. Next, the birds are dipped in hot paraffin wax, and immediately cooled in cold water. When this wax is removed by more automatic pluckers, the feather stubs stay attached to the wax. The wax is later reclaimed, while the feathers are dried and marketed as a by-product. The birds themselves are then taken from the overhead conveyor and transferred to a moving belt. Operators clean the birds, after which they may be wrapped in plastic and quick-frozen, canned or cooked.

Consumption of turkey meat by American hotels and catering establishments is high, but the greater number are sold by super-markets and provision stores. The quick-frozen display cabinet plays a prominent part in the American selling technique. Poultry packers have exploited this medium to the full by the use of attractive packs. Turkey joints and half turkeys are popular, while the canning industry takes a large tonnage every year. A more recent development is the use of large, transparent, circular roasting ovens. The customer chooses his bird while it is being cooked. It is then placed in an insulated container and taken home to be served while still hot.

Higher Sales, Lower Cost If we set about it in the right way it is certain that turkey consumption can be increased enormously in this country. But it must be remembered that in the United States the price of turkey meat is as low, and often lower, than beef, mutton and pork. Although their labour is more expensive than ours, feeding costs are much cheaper, and the latter is by far the largest single item in producing turkey meat. The Americans have also reduced costs by more direct producer-consumer contacts, while quick-freezing and canning have given their retailers a non-perishable article, on which they can take a smaller margin of profit. We, too, stand to derive tremendous benefits from more orderly production and marketing.

THE "SOFT ROOF" POLE BARN

A. K. J. QUINNEY, F.R.I.C.S., Q.A.L.A.S., A.A.I.
Agricultural Land Service, West Midland Province

Shortage of capital makes simple, cheap farm buildings specially attractive. The pole barn, which can be erected by unskilled labour for as little as 10*s.* per square yard, will meet a need on many livestock and poultry farms.

THE chief attraction of temporary buildings on the farm is low capital needs, and the "soft roof" pole barn, which comprises a frame of soft wood poles, wire netting supporting a felt roof, and straw bale walls reinforced with pig netting, certainly meets this requirement. At current prices it need cost no more than 10*s.* per square yard of covered floor area. But, in addition, its appearance is more pleasing than that of many temporary buildings, a life of 8-10 years with low maintenance cost may be expected, and it can readily be constructed by farm labour. This type of pole barn has been used very successfully for housing turkeys. A four-bay compartment 40 feet wide by 40 feet long will house about 300 birds from 8 weeks old until ready for the table. The floor is prepared with a 12-inch layer of loose straw and, as the turkeys become older and hardier, the walls are gradually removed to provide extra litter, until all the bales have been used. Food is obtained from hoppers in the building, but after the first few weeks the turkeys will thrust their necks through the wall netting for water and grit. Provided normal anti-blackhead precautions are taken, the system produces hardy and healthy birds. Regular renewal of straw bale walls may well be a factor in disease control.

Breeding gilts upwards of six months old, brought inside to avoid the poaching of leys in winter, have also done well in the pole barn. A bunch of 25 gilts with a boar can be housed in a four-bay compartment. For fattening pigs it would be necessary to provide a false coiling over the sleeping area with straw bale walls to eaves level. In an end compartment, the partial sealing of gables would also be advisable.

The building makes an excellent lambing pen, and is suitable, too, for calves up to 12 months old. For deep-litter poultry, the open ridge must be sealed with roofing felt and, in turn, this means the provision of more artificial light. Also, a pole barn to house poultry on this system ought to be in a well-sheltered situation. The building has limitations as a cover for implements, owing to the number of internal stanchions and the low eaves.

Simple Design A reasonably level, free-draining site is desirable. Surface water, including drainage from the roof, must not be allowed to lie in or near the building, and improvement in the drainage by shallow ditching may be necessary. Because of their simple construction, pole barns may be of any width, but in practice widths of more than 50 feet result in too great a height at the ridge or too little headroom at the eaves. The usual design provides for a building 40 feet wide with heights of 11 feet 6 inches and 5 feet 9 inches at the ridge and eaves respectively.

The length of the building is again a matter of choice. The supports are arranged every 10 feet, and, generally, a length of 160 feet, with internal divisions to provide four bay compartments, each 40 feet × 40 feet, has been found most convenient.

Frame. Telegraph poles or softwood poles 14 feet long are used as centre supports, and the eaves are carried on 9-foot railway sleepers. Midway between these main supports an 11-foot prop is introduced to halve the span of roof principals. The roof principals consist of 22-foot larch poles notched and nailed from centre post to railway sleepers, giving an 18-inch overhang at the eaves. Softwood thinnings are used for purlins, one at the ridge and eight on each pitch of the roof. Alternatively, sawn 3-inch × 2-inch timber may be used for the eaves beam to give a neater appearance.

Work is simplified by using the tractor post-hole digger. The tractor fore-end lift is useful for raising the heavy centre posts into position, and the workmen can use this attachment as a mobile platform when fixing roof principals and purlins. Time is saved by securing roof principals before the props are placed in position. It is particularly important that centre posts and railway sleepers should be sunk not less than 3 feet 6 inches and 3 feet respectively into the ground, to get secure anchorage. At points where access is to be provided, eaves beams are nailed over the roof principals, immediately above railway sleepers, instead of being nailed to the feet of roof principals. This gives 6 inches more headroom. Although of such light construction, the frame is surprisingly strong, owing to the negligible weight of the roof covering.

Roof Covering. The roof consists of wire netting, roofing felt, and plain galvanized wire. The mesh wire netting (18 gauge, 1½ inches) is laid parallel to the roof principals and stapled to the purlins. The netting tends to sag between purlins—a condition aggravated by workmen who kneel on it while fixing the roofing felt—and it is desirable, although not essential, to fill these depressions with straw.

Heavy gauge, non-tearable roofing felt is then laid parallel to the purlins and secured with felt nails backed with washers. The space between the ridge purlin and the immediately adjoining purlins on each pitch of the roof is left uncovered to provide light and ventilation for the building. As a final precaution against wind lift, 14-gauge plain wires are laid parallel to roof principals every 18 inches and stapled to each purlin.

Once the netting has been secured, workmen can move freely over the roof area, and subsequent operations are relatively simple. Placing the netting in position is the most difficult job. It pays to cut netting to the required length, roll from each end towards the centre, and place the centre line of the netting on the ridge purlin. When released, both rolls automatically uncoil into position. The final roof covering is surprisingly strong, and workmen applying a coating of tar need not keep their feet on the line of purlins, provided soft shoes are worn.

Walls. Side, end and partition walls are filled in with straw bales reinforced with pig netting, but the height and strength of walls can be varied with the proposed use of the building. For turkeys, walls two bales high with pig netting stapled to stanchions on the inside only are sufficient; the space between the top of walls and the roof can be closed with 18-gauge netting. Walls three bales high reinforced on both sides with pig netting are necessary for strong pigs or calves. Strictly speaking, however, straw bales should not be charged against the cost of the pole barn, because the old bales, on renewal, can be used for bedding. To close the entrances, gates 9 feet wide can be made by securing wire netting to a frame of 3-inch × 2-inch timbers, hung between the railway sleepers at convenient places.

Low Cost At current prices, a four-bay compartment, 40 feet × 40 feet, can be constructed for less than £90, or about 10*s.* per square yard of covered floor area. Another 2*s.* 6*d.* per square yard should cover main-

tenance costs during the short life of the building. At the end of its life, a barn sited well clear of other buildings may be quickly demolished, at a cost of a few bales of straw only, by setting fire to it. Where this method is unsuitable, the salvage value of railway sleepers and firewood will offset the labour costs in dismantling.

Taking into account prime cost, life and maintenance, the pole barn compares favourably with most temporary buildings. The common timber-framed building with corrugated steel sheet cladding has a life of only twenty-five years and costs in the region of 40*s.* per square yard. The cost of the corrugated iron alone is 8*s.* per square yard.

A minimum of two men is required for the construction of a pole barn, and the work is simplified if a third man is available to help with work on the roof. Three men, one working for only two days, can erect a 40-foot square section in four days at a labour cost of about £16.

An analysis of the costs of the main materials at prices ruling this spring is as follows:

FRAME

	No.	Length *feet*	Mean Diameter *inches*	Cost Each *s. d.*	Total Cost £ *s. d.*
Centre posts	4	14	9	27 0	5 8 0
Railway sleepers	8	9	11×4	7 0	2 16 0
Props	8	11	6	7 6	3 0 0
Roof principals	8	22	5½	12 6	5 0 0
Purlins	30	23	3	3*d.* per ft	8 12 6
Eaves beams		80	3×2	6½*d.* per ft	2 5 0
Nails	16 lb	6 inch		11*d.* per lb	14 8
					27 16 2

ROOF COVERING

	Length *feet*	Width *feet*	Gauge	Quantity	Cost Each *s. d.*	Total Cost £ *s. d.*
Galvanized wire netting (1½-inch mesh)	600	3	18	5½ rolls	72 6	19 18 9
Non-tearable roofing felt	576	3	Heavy	16 rolls	16 0	12 16 0
Straw				8 bales	2 0	16 0
Felt nails and washers				5 lb	2 0	10 0
Galvanized plain wire	1,190		14			18 9
Staples				2 lb	1 0	2 0
						35 1 6

WALLS

	Length *feet*	Width *feet*	Gauge	Quantity	Cost Each *s. d.*	Total Cost £ *s. d.*
Pig netting	160	3	14	1 roll	75 0	3 15 0
Galvanized wire netting (2-inch mesh)	108	5	18	1 roll	65 0	3 5 0
Gate	40		3 in.×2 in.		6½*d.* per ft	1 2 6
Gate furniture						6 1
Staples				1 lb	1 0	1 0
						8 9 7

The labour involved will amount to some 88 man-hours, of which 20 will be taken up erecting the centre posts and railway sleepers and 15 man-hours each on the roof netting and finishing with straw and roof felt. At 3*s.* per

hour, and allowing 20 per cent for overheads, the labour cost works out at £15 16*s*. To this must be added the miscellaneous expenses for tractor use, tar and creosote, amounting to, say, 26*s*. Thus the full cost of the four-bay compartment, on these figures, will be just over £88.

Some Limitations Pole barns constructed with pressure-treated timbers and roofed with steel, aluminium, corrugated asbestos or plywood sheets may last more than 20 years, and may be built to practically any size to accommodate all types of livestock. The building described in this article is the cheaper type of pole barn designed to last 7-10 years, and it is doubtful whether it could be modified economically for housing adult cattle. An overall increase of 4 feet in height would be necessary, involving extra expense and difficulties in securing a firm anchorage. Where the farm is subject to severe industrial smoke pollution, the short life of roof netting might prohibit the use of "soft roof" construction, but elsewhere it is probable that the state of preservation of the exposed parts of roof principals and purlins at the open ridge will determine the life of the building.

The possibility of collapse under snow load appears to be slight, since the roof timbers have little to support other than snow; and although the control of disease presents problems in straw buildings, this appears seldom to have become serious in practice. The inflammable nature of the materials used in construction and the difficulty of removing manure are the most serious disadvantages. A skilful workman can clean out the pole barn with a tractor-operated manure loader, but this is a relatively slow process, because of the low eaves and internal stanchions.

But against this must be set the low cost of this temporary building and its many satisfactory uses. As a means of intensifying production at low capital outlay, these simplified structures have proved invaluable, and in one instance a barn 160 feet by 40 feet certainly more than paid for itself within a year of erection.

Thanks for assistance are due to Mr. P. L. Oliver, The Meadleys, Pattingham, who is using two pole barns, each 280 feet long, and to Mr. A. Thompson, County Poultry Officer, Stafford A.E.C., who constructed buildings of similar design in Norfolk more than forty years ago.

Potash Wall Charts

Four wall charts in colour presenting the case for the value of the controlled use of potash fertilizers have been produced by Bergbau-Handel. Free copies are available to agricultural consultant services and colleges on application to Propane Fertilizers Ltd., Sterling House, Heddon Street, London, W.1.

DAMAGE TO CROPS BY LIGHTNING

M. T. SPENCE, O.B.E., B.Sc.
Meteorological Office, N.A.A.S., Cambridge

Lightning damage to crops in Bedfordshire and Norfolk this year is reported, with references to experience of similar damage elsewhere in earlier years.

ON July 6 this year two farmers in Bedfordshire found patches of withered Brussels sprouts on their farms, and two days later a third farmer in the county found the same thing. The first two farms are 2½ and 5 miles east of Bedford, the third is 8 miles south-east of Bedford. National Agricultural Advisory Service Officers are reasonably satisfied that the trouble was not caused by parasitic organism, poisonous substance or soil deficiency. In their opinion, the damage was caused by lightning during a storm a few days earlier. The facts that the damage has not spread, that the damaged area on one of the farms has been successfully replanted, and that by July 17 some of the damaged plants had shown new growth from the roots, support this view.

All the affected patches were roughly circular, but in one instance some of the plants within the circle, particularly towards the outside edge, were hardly damaged at all. The diameters of the circles were 20, 30 and 35 yards. A secondary damaged patch was associated with the largest of the three: this was about 90 yards away, roughly circular, and about 15 yards in diameter. Between the two circles only plants here and there were damaged, sometimes in groups of five to ten.

All the injured plants had the same appearance. One or more of the leaves of each were partly or wholly scorched. Those partly scorched were damaged mainly at the edge. Leaf scorching was often V-shaped, with the tip of the "V" pointing to the mid-rib of the leaf. The mid-rib and leaf-stalk running from this point to the stem appeared blue, compressed and shrivelled. Where the shrivelled leaf-stalks joined the stem, usually an inch or less above the ground, most of the pith had been destroyed and the outer wall of the stem ruptured, causing the plant to fall over as though hinged at this point. The more severely affected plants had their stems broken for an inch or more in length. The roots of the plants appeared to be unaffected.

The two photographs on p. ii of the art inset show the damage done to one plant. They were taken fourteen days after the injury. By that time the plant had decayed, and it was therefore hung upside down before being photographed to allow the leaves to take up a more nearly normal position relative to the stem.

Some Other Cases Features similar to those described above have been observed in known cases of lightning damage. Thus Mr. J. O. Page, Horticultural Officer for Lincolnshire (Holland), writes:

"I have seen many cases of lightning damage to potato crops, but the only time I saw it happen was some years ago, when a crop which I was inspecting at Hundreds Farm, Long Sutton, received a flash about a hundred yards away from where I was. There was thunder about at the time and I saw a bright streak hit the crop (King Edwards). I heard no thunder but there was a noise like the loud crack of a whip. Investigating, I found a patch

where the stems of the plants had been split and flattened over a circular area about ten yards across. There were a few potatoes lying on the surface of the soil, and these had burst open, especially at the end of the rows. About 5 yards from the edge of the damaged area were three other small patches about a yard square showing similar damage. The edges of the leaves showed burn marks. These secondary areas of damage have been noted in other cases.

"After a few days the affected portion usually dies off, but some plants send out new growths from the first leaf axils. Usually, only a few potatoes are smashed at each root and some roots show no mechanical damage.

"In a case of damage to strawberries which I saw, the circular patch was about 7 yards across. The leaves were burned and brown, the crowns or growing points of the plants, were not affected. Tall groundsel plants in the patch were not affected in any way.

"In a case of lightning damage to sugar beet, the edges of leaves were burned and brown and the leaf-stalks split lengthwise."

Jones and Gilbert[1] refer to the circular shape of the damaged area as characteristic and the absence of mechanical disturbance as quite common in lightning damage to crops. They also say that "strikes" in several spots close together have been noted.

Orton,[2] describing the effect on a cabbage field in Erie, U.S.A., in August 1919, speaks of an almost circular area of damage. The most noticeable damage to plants there occurred about two or three inches above the ground, where the stems were shrivelled on the more seriously injured plants. In every instance the mid-ribs of the lower six to eight leaves showed marked injury on both sides, taking the form of collapsed shrivelled tissue.

A point of difference between the Bedfordshire cases and most others reported is that the measured diameters of 20-35 yards are big, compared with the average of 10-30 feet. However, large areas of damage have been seen before, and it has been suggested that they are associated with the presence of surface water—the greatest damage being done when the lightning occurs soon after rain begins. According to this theory, the drier soil below the surface favours the wider diffusion of the shock through the recently wet or flooded surface layer. The thunderstorm that occurred on Monday, July 2, and which no doubt caused the damage in Bedfordshire, came at a time when the upper layers of soil had dried out since the rain which fell on Thursday of the previous week.

An interesting difference between the damage to sprouts in Bedfordshire and the cabbages in Erie is in the height above ground at which injury to the stalks occurred—an inch or less on the sprouts, compared with two or three inches for the cabbages. The injury to the stems of the sprouts generally occurred where the leaf-stalks of the tallest leaves joined the stems. No doubt the injury to the cabbage stem was in the same place relative to the leaves, the difference arising from the fact that the tallest leaves probably joined the stem higher above the ground. This explanation is attractive, because it visualizes the tips of the tallest leaves acting as release points for the exchange of electric charge between cloud and ground.

In view of the frequency and wide distribution of thunderstorms, it is surprising that reports of damage to field crops are comparatively rare. Part of the explanation is that trees in and around fields tend to act as lightning conductors and so save the crops, but probably a more important factor is that only certain field crops are vulnerable. There are no reports of appreciable damage by lightning to grass and cereals, and such crops

cover most of Britain. Jones and Gilbert describe a case in which the line dividing a crop of cotton and maize passed through the centre of an area struck by lightning. On one side, the cotton was killed over a semi-circular area; but the only injury evident to the corn was the splitting of a few stalks, and none of the plants died.

Selective Damage in a Glasshouse Similar selective damage can occur under glass, although normally the inside of a glasshouse, when the exterior is wet with rain, is comparatively safe from lightning. This is because the intensity of electric charge inside a closed hollow conductor is zero, and, when wet outside, a glasshouse is virtually a conducting shell. However, in a Norfolk glasshouse, struck by lightning on July 9, 1956, the strings from the roof and the tomatoes which they supported were probably wet when the lightning struck (the plants in the glasshouse had been well watered just before the storm), and so acted as conducting channels between roof and floor. Only one patch of tomato plants was damaged, the remainder being entirely unaffected.

A report made by the owner a month after the event said:

"The glasshouse structure is undamaged. Practically no green leaf is now left on the damaged tomato plants until the fifth truss is reached. Tomatoes on the first truss, which had already set at the time of the flash, are ripening, but hardly any tomatoes have set on the second to fourth trusses. Tomatoes appear to be setting on the fifth truss and above. Some of the plants show scorch marks, about ¼ inch broad, running for two or three feet down the stem.

"Every bit of green has dried up and is falling from some potted ornamental ferns and azaleas on a wooden rack at the end of the rows of damaged tomato plants, but some young growth is now developing quite vigorously.

"A gardener wearing rubber boots was in the glasshouse at the time and saw the flash travel along the gutter, which was filled with water. Seedlings in three boxes on wooden shelves directly beneath the gutter are untouched, but in two of the boxes several nettles and one dock, as well as some young fat-hen plants, were killed outright."

References

1. Lightning Injury to Herbaceous Plants. L. R. Jones and W. W. Gilbert. *Phytopathology*, 1918, **8**, 270-82.
2. Lightning Injury to Potato and Cabbage. C. R. Orton. *Phytopathology*, 1921, **11**, 96-8.

FARMING AFFAIRS

A New System of Glasshouse Watering A new system of automatic glasshouse watering has been under trial at the Fernhurst Research Station of Plant Protection Ltd. It comprises 2¼-inch diameter black polythene tubing, machine-punched with sets of four holes of $\frac{1}{11}$-inch diameter every 5 inches. The tubing lies flat on the ground, requires no nozzles, and is placed permanently between the crop rows for low-level soil watering.

The system is said to produce results at least as good as careful hose watering, but the equivalent of half an hour's hose watering can be given in about six minutes. Water penetration is better and run-off is less on sloping beds. The system can also be used for winter flooding, applying soil sterilizing chemicals, and for liquid feeding. The cost is about 3*d*. per foot-run of tubing, which merely has to be cut to length, laid on the beds in its permanent position, and connected to the water supply. The life is not yet known, but should be at least two years.

When filled with water the tube inflates, so that there are two rows of holes on each side, the lower holes delivering water near the tube and the upper holes further away. Only 15-25 lb/sq in. pressure is needed. Control is effected simply by turning on the main water-cock, noting the length of jet thrown, and throttling back the flow until the required throw is obtained. This may be 6-18 inches on either side.

The length of tubing used depends on the water output available and on pressure difference due to the slope of the ground and friction loss in the tube. The output needed is quite large—450-750 gal/hr for 100 feet of tubing. It is therefore important to make sure that the main connections to the tubes are sufficiently large to allow unrestricted flow. Pressure difference affects jet-throw, and in practice about 3 inches difference can be allowed if watering is to be uniform. For example, a 12-inch throw can be allowed to vary from 13½ inches at one end to 10½ inches at the other end of the tube; on level ground, this is possible with a tube length of about 90 feet.

If the ground slopes gently, it is an advantage to feed water downhill, as the slope compensates for friction loss and a longer tube can be used. For example, with a fall of 4 in./100 ft, a length of 115 feet could be used for a 12-inch throw. For watering uphill, the length must be shortened (to 60 feet in the example taken), but, if desired, watering up and downhill can be combined.

A useful tip for improving pressure in a long tube or on a steep slope is to restrict the tube about halfway along by means of a wire-spring clothes peg.

When planning a new installation, the correct layout can be ascertained either: by trial and error with a length of tube fed with water from the end, and using the clothes peg for local improvement of control; or, by taking levels, ascertaining the slope of the ground, and then making use of the detailed tables worked out by Plant Protection Ltd. for the benefit of users.

R. T. Pearl

Farm and Forest: 20. Utilization of Thinnings So far in this series the farmer has, in the main, been advised how to grow trees. The notes during the next few months will therefore deal with the utilization and marketing of timber.

There are two main types of product from the farm plantation—small round timber and saw timber. The small round timber will come from the

thinnings which are removed from time to time to favour the development of large, well-formed trees to be left to grow to maturity. The need for this periodical thinning of plantations was mentioned in the September 1955 issue.

The number of poles removed from the crop at any one thinning can vary widely according to species, age and site. However, in the first two or three thinnings at least, the yield may be as many as 200-300 poles per acre. The thinner specimens will probably make good fencing material, including posts, struts, rails, water gates, hurdles, temporary fences (for example, cleft fencing and supports for electric fences) and stiles. Racks for drying hay can also be made from this type of material. The farmer will no doubt also find a use for a few of the larger poles, which should help meet his requirements of timber for barn posts, straining posts, cattle crushes, bridging and shoring up banks of streams and large ditches, and so on.

Most of the uses to which round timber will be put on the farm will involve exposure to dampness, and so it should be a general practice to treat such timber with a good preservative. Creosoting is deservedly the most popular simple treatment, and a very effective and easy method of impregnating wood with creosote is the hot and cold, open tank process.

Any surplus to the needs of the farm can be sold. But before offering standing trees for sale they should be marked for thinning and a tally made of the volume, so that seller and buyer can negotiate a fair price. This may seem an unnecessary piece of advice, but it is not unknown for timber to be offered without the vaguest reference to the quantities involved. The marketing of trees for thinning and assessment of total volume calls for a certain amount of skill. If the area to be dealt with is only an acre or two, the farmer may be able to do the job himself, possibly after having a word with the local officer of the Forestry Commission. If, however, the area is fairly large, then the farmer would be well advised to approach a forestry contractor or a firm of timber merchants that maintains a forestry section to do just this kind of work.

The farmer has also to decide whether he wishes to sell his trees standing or whether he is going to fell and sell at stump or roadside. The former practice has something to recommend it, for once a deal has been made the responsibility for the removal, transport and marketing of the poles rests with the buyer. If there is a lot of timber to be sold, the farmer should have no difficulty in finding a merchant willing to accept this method of sale. It is worth ensuring that the method of tallying is acceptable to the buyer before it is applied, since there are certain well-established practices in this business, as in the sale of any other farm produce.

Anyone in doubt as to the amount or class of timber that can be felled without a licence should, of course, first seek advice from the local Conservator of Forests.

C. D. Begley,
District Officer, Forestry Commission

Turkey Experiments to Continue at Sprowston As the result of a new agreement between the Minister of Agriculture and the Norfolk Agricultural Station at Sprowston, experimental work with turkeys will now form a permanent part of the work of the Station.

Since 1954 the Norfolk Agricultural Station has built up and operated on the Ministry's behalf a centre for the demonstration of improved turkey breeding and management practice. The Conditional Aid grant, which played such a big part in getting the project started, has now expired, but

the new arrangements will enable the work which has been initiated to be developed into a definite long-term programme. This programme will be agreed between the Station and the Agricultural Improvement Council for England and Wales.

Changes in Bull and Boar Licensing Among other things, a different type of licence for dairy bulls is required under new regulations governing the licensing of bulls and boars in England and Wales, which came into operation on October 1, 1956. The regulations are made under the Improvement of Live Stock (Licensing of Bulls) Act, 1931, as amended and applied to boars by Section 6 of the Agricultural (Miscellaneous Provisions) Act, 1944.

In future, the old Dairy (Official Milk Record) licence will be replaced by a Dairy Bull licence, which will be given to a bull only if both its dam and sire's dam have produced in a lactation period of 305 days a qualifying yield of milk and butter fat. The qualifying yields, which are set out below, are those recommended by the Bull and Boar Licensing Advisory Committee. They vary according to the breed and the lactation. Only one qualifying yield is required from each ancestor, so that if either the dam or the sire's dam does not give a qualifying yield with her first calf she may do so with a second or later calf.

A bull of the dairy breeds which is not eligible for a Dairy Bull licence but is otherwise suitable will be given a General Class Bull licence. This may be exchanged for a Dairy Bull licence if the bull's ancestors subsequently give qualifying yields.

Qualifications for the Dairy Bull Licence

MINIMUM MILK YIELD AND BUTTERFAT CONTENT

Breed	With the First Calf		With the Second Calf		With a Subsequent Calf		Minimum Percentage of Butterfat Content
	Milk	Butter-fat	Milk	Butter-fat	Milk	Butter-fat	
	lb	*lb*	*lb*	*lb*	*lb*	*lb*	*per cent*
Ayrshire	6,500	247	7,500	285	9,000	342	3.8
British Friesian, British-Canadian Holstein-Friesian, and Red and White Friesian	7,000	250	8,000	280	9,500	333	3.5
British White ...	5,500	209	6,500	247	7,500	285	3.8
Dairy Shorthorn, Lincoln Red Shorthorn, and Northern Dairy Shorthorn... ...	6,000	225	7,000	262	8,000	300	3.5
Dexter	4,000	160	5,000	200	6,000	240	4.0
Guernsey	6,500	310	7,500	355	8,500	400	4.25
Jersey	6,000	300	7,000	350	8,000	400	4.5
Kerry	5,500	203	6,500	240	7,500	277	3.7
Red Poll	6,000	225	7,000	262	8,000	300	3.5
South Devon ...	5,500	220	6,500	260	7,500	300	4.0
Welsh Black ...	5,000	200	6,000	240	7,000	280	4.0

Another change under the new regulations concerns the address for applications. Applications for licences, which must be made not later than 28 days before the licensing age (10 months for bulls and 6 months for boars) should now be sent to the appropriate County Office of the Ministry, and not to the Ministry's Headquarters in London or Aberystwyth.

Chesterford Park Research Station The strength of an industry depends basically upon three things—the application of its workers, the skill of its research people, and the ability of those whose job it is to translate discovery into practice. And although to the casual eye the scientist's work is quiet and unpretentious and his progress often slow and uneventful, we must not underrate the part which he plays in this trinity. Certainly in farming we must rely upon our research workers to provide not merely the means of making two blades of grass where only one flourished before, but also of controlling the pests and diseases which, if left unchecked, would speedily bring starvation to much of the world's fast expanding population.

Thus the opening last month of the new Fisons Pest Control Research Station at Chesterford Park, near Saffron Walden, Essex, was of greater significance to the Commonwealth farmer than just the expansion of a large commercial organization: it was a welcomed addition of more workers to the by no means overlarge body now at work in the field of agricultural research. It was therefore most fitting that the opening ceremony should be performed by Sir William Slater, the Secretary of the Agricultural Research Council.

Speaking in reply to Mr. F. G. C. Fison, the Chairman of Fisons Ltd., Sir William referred to what he called "one of the greatest revolutions of the last twenty years—the advent of the organic and bio-chemist into the field of pest and weed control". The large commercial organizations have played a major part in this revolution, not only as producers of organic chemicals, but equally in the discovery of new substances, their formulation and method of application. "Only the chemical manufacturer can decide whether a complex organic molecule, which may have insecticidal properties, can be made at an economic cost," said Sir William. "Without this knowledge, laborious synthesis and biological tests may have no more than academic interest. He, too, is in a better position to study its formulation and to test methods of application than a university department or a research institute."

Yet, although the research services on the one hand, and the commercial station on the other, may often be treading different paths, their goal is the same. And because of the relatively small amount of basic knowledge available on the chemical control of pests, the commercial organization must occasionally lean heavily on outside workers. In the words of Dr. G. S. Hartley, Director of Research in the Company, "It is most particularly in the study of the indirect and long-term effects that we feel the greatest need of the research and advisory services. We must accept the burden, which Sir William has laid upon us, of providing thousand gramme quantities. We will exchange it for the study of thousand-day effects".

L. W. Tolladay

A National Certification Scheme for Herbage Seeds There is a lot in having the right tool for the job. The latest instance of this is the importance of selecting the right herbage seeds for a specific role on the farm. Although the farmer now has the choice of many strains of grasses and clovers bred to meet particular requirements, he has, with a few notable exceptions, little chance of being able to check the genuineness of the seed offered.

Thus there should be a warm welcome for the new National Scheme for Comprehensive Certification of Herbage Seeds, the main aim of which is to bring to the notice of farmers, by a distinctive certification trade mark, the availability of a genuine product which has satisfied certain standards. At

the same time, the scheme will unify the various standards and procedures already adopted in the pilot schemes of certain local seed growers' organizations.

The scheme, which is operating for the first time this season, is a voluntary co-operative effort by the growers, merchants and technicians concerned with herbage seed production in England and Wales. A Certifying Authority, representing these three interests and under an independent chairman appointed by the Ministry of Agriculture, Fisheries and Food, is responsible for formulating and applying the rules and standards of the scheme. It will be administered through the Seed Production Branch of the National Institute of Agricultural Botany. Some 90 per cent of eligible crops, totalling 26,000 acres, were entered for certification this year, and 850 growers and 95 merchants are participating.

Only crops of listed eligible strains can be accepted in the scheme. The list includes strains of grasses and clover bred by three official plant breeding stations—namely, the Welsh Plant Breeding Station, the Scottish Plant Breeding Station and the Plant Breeding Institute, Cambridge—and provision is made for old-established local strains, particularly of clovers, whose performance has been established and which have been previously included in approved seed crop inspection schemes. The crop must have been grown from an approved stock on selected fields and have satisfied certain standards on field inspection. The grower is responsible for maintaining the identity of each lot of seed from harvest until he sends it for processing by the merchant, and, similarly, the merchant is responsible for its identity during processing. Only when the certificate number issued by the Certifying Authority has been entered on the labels does the Certification Trade Mark printed on them become valid.

All certified seed is liable to be sampled independently on behalf of the Certifying Authority so that seed standards and authenticities can be verified. A similar service may be requested by any purchaser.

Profits from Hen Batteries Speaking to an audience of Essex poultry farmers at Chelmsford on October 24, Dr. W. P. Blount, Poultry Adviser to B.O.C.M., stressed the importance of correct feeding in the battery system. For, as he pointed out, "Economy in feeding is the greatest single factor affecting costs". The ration used must be balanced for egg production and sufficient food must be given for maximum output. It is false economy to use large amounts of cheap, unbalanced feeds or to limit food intake without considering the body weight of the birds and their potention production. A grain and poultry grain balancer ration is often the cheapest to use, mixed in the proportion of 40 per cent grain with 60 per cent grain balancer feed.

There were, continued Dr. Blount, some half a dozen factors influencing profits from egg production on the battery system. They include: the total number of saleable eggs; the proportion of high-priced "winter" eggs; the cost of feed and amounts used; an ability to cull rigorously; and the proportion of eggs sold as first grade, top quality (clean and non-cracked). The *total* number of eggs laid will depend primarily upon the genetic make-up of the birds, but the numbers which are saleable will be affected partly by the cage floor design, since some cages lead to quite a high proportion of cracked or dirty eggs. Cracked eggs are also frequent when the calcium: phosphorus ration of the diet is faulty. Indeed, the chief mistake of poultry farmers today is that they give too much limestone grit.

Most layers do far better in winter if they are "stimulated" by means of

electric or other artificial lighting. Experiments show that egg production is highest when 14 hours of sunlight are recorded, and lowest in winter when there are only 8¼ hours of daylight. If a steady 14 hours of light is provided (daylight plus artificial light) in the autumn, a comparatively high level of production can be maintained at a time when egg prices are also high. The most common fault is to start artificial lighting too late in the year. It should begin in mid-August with half-an-hour a day. The light is best given in the middle of the night. Measurement of the artificial light is important. There should be 2-3 "foot-candles" at the level of the birds' heads.

Thought should also be given to ventilation and insulation. When the temperature approaches freezing point, food consumption will be increased, whilst at or below freezing point egg production will fall sharply. When room temperatures exceed 70°F, appetites are lost and food intake falls. Naturally, this will soon affect egg production. Shells become thinner and less resistant to damage by cracking, whilst egg whites become more watery and the yolks "bubbly". A room temperature between 45 and 70°F will pay in the long run.

Dealing with food wastage, Dr. Blount recommended pellets as being generally better than mash, firstly because they are more palatable, and secondly because less food is lost from the birds' beaks into the water troughs. Pellets are also easier to handle and are less dusty. The design of the food trough on a battery cage is all-important. In some, the loss of food may be as much as 2 per cent daily—equivalent to a yearly waste of one cwt of food per 50 birds.

Finally comes the labour, which accounts for between 10 and 20 per cent of the total production costs of the battery system. But there is no doubt that a little work-study would pay handsome dividends on many farms. The labour bill can also be reduced if women are used instead of men. With full-time labour, it is very important to see that the poultryman is given a "one-man" unit of, say, 1,500 pullets in single-bird cages; he will be wasting about 20 per cent of his time if only 1,200 birds are kept.

Agriculture goes to Knightsbridge The new headquarters of the National Farmers' Union were opened by the Queen Mother on October 18. "Agriculture House," as it is called, is an impressive neo-Georgian building of red brick and Portland stone standing in Knightsbridge, a stone's throw from Hyde Park Corner, and housing the complete administrative offices with its staff of 160, the Council Chamber committee rooms and members' dining-room and bar. The Fatstock Marketing Corporation occupies two floors. Most of the ground floor has been taken by two banks, an insurance corporation and other organizations, including the London Office of the I.F.A.P.

"The horse, the hay-cock and the hedgerow are passing, like much else we hold dear," said the Queen Mother. "New machines and new methods have brought new sights and sounds to the familiar fields of our youth." Knightsbridge, too, which was one a sylvan suburb, has acquired a "new look".

IN BRIEF

Polled Ayrshires

Sir Alick Buchanan-Smith, of the University of Edinburgh, writes in the autumn issue of *Scottish Agriculture*: "It is for every breeder of Ayrshire cattle to decide for himself whether to breed them without horns. Where the cattle are kept in courts or yards, then there can be no doubt about the advantage of having polled cows. I forecast that for this reason the English farmer will soon show considerable interest in getting polled Ayrshires . . . But breeders must not think that it is a quick process to breed the horns off their cattle. For some time to come the bulls available for insemination will be heterozygous, that is to say they will, when mated to horned cows, on the average, leave only every other calf without horns, and so only one in four will be a polled heifer. That means that it will take about eight inseminations to get a polled heifer. It is desirable that as many as possible of these polled heifers should be born in high-producing herds. Only so can we hope to obtain a polled bull suitable to breed from. When such a bull, both of whose parents are polled, is bred he will probably be heterozygous. But there is a one in three chance that he may be homozygous, which means that all his calves will be polled. And when we reach that stage we shall begin to move.

"The important thing in a dairy cow is her capacity to give milk and live long. Milk records and conformation come first, and if these are sacrificed for the polled condition, then great harm will be done. At this stage, only the best animals are worth polling. That is why the Milk Marketing Board's policy of controlling the registration of polled bulls is so very wise."

S S S

New Way with Barn Hay

A recent trend in the United States is towards the barn drying of loosely baled hay. The bales are stacked on edge as tightly as possible, and the joints between successive layers are broken as much as possible. Loading depth is 6-8 bales or 9-12 feet. Resistance to air flow at about 1 in. w.g. is only slightly higher than that usual for loose hay. Moisture content at baling should preferably not exceed 35 per cent.

This method is of considerable interest in Britain, where the use of pick-up balers is increasing. Some preliminary experiments with the method have been carried out this year.

S S S

Sheep on Dairy Farms

Bearing in mind that total milk production in this country now substantially exceeds the liquid demand, the use of sheep as a subsidiary enterprise on dairy farms, and as an alternative to the production of extra milk, is examined in I.C.I. Bulletin No. 7. A breeding flock can readily be integrated with a dairy herd where intensive grassland management and generous fertilizer treatment is practised. During the spring and early summer the ewes can graze fields unsuitable for intensive use by the dairy herd, or surplus to their requirements, while later in the summer the flock can act as scavengers after the herd.

From information gained on eleven intensive grassland dairy farms, such a flock was seen to be highly profitable. Where a subsidiary sheep enterprise was operated, the income amounted to £162 for each £100 spent. In fact, the return on money spent was higher than that from the dairy herds.

(See also Book Review on p. 402.)

Muck-carting with Little Labour

Wherever it is practicable, spreading manure direct from where it is made is better than making a field clamp: it economizes in the use of labour and reduces loss of nutrients. But often this is a counsel of perfection which does not fit in with other requirements of farm management, and frequently field clamps have to be made. However, one man equipped with a tractor-loader and a hydraulic tipping trailer can clear yards and cart the manure to a clamp at a reasonable rate. Alternatively, replacing the tipping trailer by a trailer-spreader he can deal quickly with clamps, or he can spread direct from yards.

This "one-man" system is particularly suitable for small farms, but even on large farms, labour for these jobs can often be used most efficiently by equipping each man with his own tractor, front-mounted loader and a tipping trailer when he is making clamps, or a spreader when the muck is to be distributed on the field.

With direct spreading, assuming a transport distance of a quarter of a mile, about 3 tons can be loaded and spread per hour without tiring the man. Working steadily, a large amount of manure can be shifted in a few days.

For direct spreading, a two-man gang consisting of two tractors, one loader and one spreader tends to be uneconomic; but two men can work efficiently with two spreaders, or at transporting manure from yards to clamp, using one loader and two trailers. Both men are required for operating the fork and conveyor-type loader, and where a hydraulic loader is used, the second man can help in the building of good loads.

When Pigeons Breed

Although extensive observations covering the whole country have been made on the breeding of the wood-pigeon, no intensive investigation has until lately been carried out in a single region. An intensive study of wood-pigeon breeding in Cambridgeshire was made in 1955, during which details of dates, clutches, mortality and predation, and the positions and heights of some 700 nests were recorded. This project has shown that, although the species has a long breeding season lasting from March until October, the bulk of the wood-pigeon population does not start breeding until July or August, and the main successful period of breeding appears to be limited to August and September.

Further experimental work is now in progress to ascertain whether interference with breeding, by nest destruction, can effectively reduce wood-pigeon numbers, and whether such a method is economically practicable. No results are yet available.

L. G. Ridpath and R. K. Murton, The Agricultural Review, October 1956.

Sheep Shearing Record

The brothers Ivan and Godfrey Bowen have introduced a new sheep shearing technique in New Zealand and have demonstrated it extensively. One of their demonstrations was before the Queen and the Duke of Edinburgh during their visit to New Zealand in 1953-54.

In January this year a team of nine New Zealand Wool Board Instructors, led by Mr. Godfrey Bowen, sheared 3,156 Romney ewes in a 9-hour day.

Automation Progress

There will be a wide welcome for the new monthly periodical, *Automation Progress*, published by the Leonard Hill Technical Group (annual subscription £2 10*s*.; 4*s*. 2*d*. monthly, including postage). Its declared aim is to introduce engineers and technicians to the problems and achievements of their fellow-specialists in related branches of technology, and certainly only by full and facile exchange of information and ideas can the devices of electronics and the widest interpretation of mechanical handling be applied effectively in a new era of industrial development.

In its first editorial the journal pillories the gross misuse of the word "automation": "No word has been the pretext for more woolly thinking than automation. On the one hand, there are the pipe dreams featuring a life of leisure with machines doing practically all the chores; on the other hand, there are the well-known predictions of labour troubles and economic disaster that have been with us since the invention of the spinning jenny.

"It is not the word but the ideas behind it that have caught the imagination, and there is no denying the almost universal interest which has been aroused. Conferences and study groups on automation ranging from the Institution of Production Engineers to the Merthyr Tydfil Productivity Committee are being held throughout the country, indeed throughout the industrial world. The popular press of all countries has publicized news and views on automation until it becomes difficult to understand what the word is intended to convey. Well-meaning comments and exhortations have been distinguished by zeal, rather than discrimination."

Wanted: a definition.

Machine-harvested Sugar Beet

Nearly 43 per cent of Britain's sugar beet crop was harvested by machine last year—a total acreage of 172,857. (The figure includes semi-mechanical harvesting, for example, where hand-topping followed spinner-type machines.) In 1954, when almost continuous autumn rain followed a wet summer, and so made the operation of machines extremely difficult, only 29.5 per cent of the crop (123,139 acres) was mechanically harvested. Growers' experience that year did not augur at all well for the development of mechanical harvesting, yet, in point of fact, the experience gained had the opposite effect and resulted in many changes in design and innumerable improvements. Manufacturers and farmers alike learned the hard way.

In its report for 1954 and 1955, which covers ten years' operation, the British Sugar Corporation anticipates that this year there is every likelihood that more than half the total crop will be gathered by machine.

Ploughing in Comfort

An all-weather-defying farm tractor, fitted with an air-conditioned cabin for summer and heated during the winter, is reported to have been on show in Pennsylvania recently. The "old 'uns" will scoff, but anything that makes the ploughman's job more congenial is no small farming asset these days.

BOOK REVIEWS

The Land Called Me: an Autobiography. SIR E. JOHN RUSSELL. Allen and Unwin. 25*s*.

Sir John Russell is one of the greatest and the most widely honoured agricultural scientists of all time. After thirty-one very strenuous years as Director of Rothamsted Experimental Station, he retired in 1943, endured and recovered from a serious illness, and plunged once more into a period of intellectual activity that has culminated in the writing of this autobiography. It is a story of a triumphant battle against initially heavy odds, in which one of the chief ingredients of success has been an infinite capacity for work.

Sir John (as he became in 1922) was born at Frampton-on-Severn in 1872. His father was a schoolmaster and later a Unitarian minister, who at one time had to support his wife and four children on a salary of £120 a year. Life was hard, and the first part of the book gives a very vivid picture of respectable, but hungry, lower-middle class life in mid-Victorian times. Russell showed an early interest in chemistry, and at the age of fourteen got his first job, at 7*s*. a week, labelling bottles of pills for a homoeopathic chemist. But he felt that this was not getting him far, and through all his family's vicissitudes (they lived in seven different parts of England in his first twenty years) he took every opportunity to read and study. He was largely self-educated. At fifteen, he read Carlyle's *Past and Present* " which greatly appealed to me . . . because of its insistence on the importanc of work ". At one period he intended to enter the Unitarian ministry, and went to the Presbyterian College, Carmarthen, but science called him back, and from Carmarthen he won scholarships which enabled him to study chemistry at Aberystwyth and Manchester, where he also took an active interest in social work. With his appointment in 1901 as lecturer in chemistry at Wye Agricultural College, the call of the land was irrevocably obeyed, and Russell decided that his life's work would be " to build up an agricultural science ". Certainly no one man has done more than he in achieving that object.

And so to Rothamsted in 1907 as chemist under Sir Daniel Hall, whom he succeeded as Director in 1912. Immediately he began the great expansion of the Station's activities that characterized his directorship. Neither the two wars nor the depression checked him, but the second part of the book contains disappointingly little about the great work which he did at Rothamsted. He spent much time travelling—in the United States, Europe, Russia and throughout the Commonwealth. We learn that from his earliest days he always took copious notes of everything he did or saw, and from these notes he has drawn wonderfully clear vignettes of life, particularly rural life, in some twenty different countries. Russell has been a great observer and missed little of significance. These accounts of his travels are full of interesting and illuminating incidents and, as they mention all the important people the author met, constitute a little encyclopaedia of agricultural scientists—and others.

The book is modestly and at times beautifully written, though the frequent use of the colon and semicolon occasionally leads to ambiguity: " . . . I sat next to a Hungarian girl who had just escaped across the frontier; it was costly but not too difficult ".

G.V.J.

A Study of Farm Organisation and Management in the North-West, 1953-4 and 1954-5. (University of Manchester, Department of Agricultural Economics Bulletin No. 83). 5*s*.

This report marks a new departure for the University of Manchester, Department of Agricultural Economics. Compared with reports of previous years, the analyses are more extensive, and the results are discussed at greater length. But apparently it is not intended to issue such a detailed report every year.

The first part contains a separated, detailed description for the years 1952-53 and 1953-54 of some of the major types of farming found in the north-west. For each farming type is included a description of the cropping, and the changes in crop prices and sales over the two years with the reasons for them. Information is also supplied on the output, costs and income per acre for identical samples of farms.

An excellent addition to this kind of report is the inclusion of the important economic relationships for each type of farming. In the case of the arable farms, for example, correlation analyses have been made of many items, including investment income per acre with the number of acres of high-output cash crops, to show that one of the reasons for high investment is that farms have a high proportion of land in sugar beet, potatoes, peas and vegetables. On livestock, rearing farms, one analysis, involving the problem of the best density of sheep per acre, clearly brings out the lesson that the higher output per sheep obtained with low stocking does not compensate for the fewer sheep kept. Many such current problems are carefully investigated for each type of farming. The resultant discussion and conclusions will help farmers and advisers to understand the economic aspects of these problems in relation to the technical issues.

The second section is a short discussion of the step-by-step procedure for analysing the farm business. Farmers would do well to study this procedure carefully and apply it to their businesses. The steps are the basis of farm management and, although now available in bulletins from several University Departments, are well worth recapitulation.

The third part is perhaps the most useful for individual farmers, because examples of partial budgeting show how adjustments can be made to the farm organization in order to increase profit. Many examples are given and all are clearly illustrated with actual figures so that the reader can readily make adjustments to suit his particular costs and circumstances.

The final section consists of a large number of tables presenting the financial results and measures of economic efficiency for 1953-54. The results for 1954-55 have also been added in tabular form, but detailed descriptions are not given. These average results are extremely useful for the practical analysis of the farm business, but it is surprising to find so much space taken up with the individual farm results which, in themselves, are of interest only to the individual farmer.

This is an excellent report of the organization, analysis and planning of farming in the north-west. As such, it is worthy of serious study by farmers and advisers in all areas.

G.A.H.

Pigeon Shooting. RICHARD ARNOLD. Faber. 16*s*.

Of all birds in Britain, the wood-pigeon does the greatest damage to our crops. Farmers throughout the country call for the destruction of wood-pigeons, and the Government offers a rebate on cartridges used to this end. Shooting is at present the only satisfactory way of killing these birds, and here, most opportunely, is a book dealing exclusively with the art of shooting pigeons.

The author assumes that his reader knows how to handle a gun and, apart from offering advice on the best type of weapon to use, the book is devoted mainly to woodcraft and the natural history of the wood-pigeon, together with notes on the other British doves. Whether shooting pigeons for sport, or controlling them as a pest, the best results are likely to be obtained when shooting from a properly constructed hide over carefully placed decoys, and the chapters dealing with these are excellent. Mr. Arnold describes the siting and construction of hides to suit most conditions, and advises how to place and set up decoys to take advantage of wind and local topography. The instructions for making one's own decoys should appeal to the handyman.

It is commonly supposed that the pigeon is a difficult bird to kill and that a magnum gun and cartridge are essential to success. Mr. Arnold devotes a chapter to the gun and cartridge and another to the powder and shot. Here the experts will undoubtedly disagree, but the author maintains, I think convincingly, that the average game gun and game load are adequate. The lesson to be learned is that woodcraft rather than firepower is needed.

The Ministry of Agriculture promotes "battue" pigeon shoots and also keeps a register of "lone wolf" pigeon shots. The organization is in the hands of the County Pests Officers, and for those who wish to avail themselves of these services a list of addresses is given. Some of these addresses are now out of date and in case of doubt reference should be made to a current telephone directory.

The book concludes with reminiscences from the author's shooting diary and, not least, some useful recipes for cooking pigeons.

E.N.W.

Rockall. JAMES FISHER. Geoffrey Bles. 18*s*.

That the granite block of Rockall, 191 miles west of St. Kilda, is the utmost part of the British Isles, did not gain official recognition until 18 September, 1955, when atom-age politics made its formal annexation a matter of necessity. The highlight of this book by Mr. Fisher is the chapter describing the landing, by helicopter, of a naval party from H.M.S. *Vidal*. It was also a highlight of Mr. Fisher's career, for, as scientist accompanying the expedition, he achieved an ambition of many years' standing—to set foot on this remarkable rock. "Now I have put all of Rockall that I can find, together in a book. Has the climax of my own personal obsession with this tiny rock tempted me to make much out of little?" Many will be quite unable to raise enthusiasm for this mite of the earth's crust, battered and spray-splashed by Atlantic gales, without soil, without shelter—without hope; and there will be those to whom this book will appeal as a saga of human endeavour to attain the well-nigh impossible. Which side he will take, the reader must decide for himself.

Mr. Fisher's tenacity in research has unearthed Rockalliana in the most unlikely places—old atlases, popular magazines, the *proceedings* of learned societies, and Admiralty logs and charts. Some of the tales are the figments of fertile imaginations, but others represent genuine and valiant attempts to effect a landing, rarely successful, or to pursue careful, scientific investigation in the neighbourhood. It is surprising that so few yachtsmen have accepted the challenge of this distant mark, and that the Royal Navy waited 144 years before capping the success of H.M.S. *Endymion* in effecting the earliest-known landing in 1811. Coastal Command navigators knew it well both during and after the war, and the photographs taken from their aircraft are the handsomest feature of this book. One wonders, too, why there have been so few wrecks on this rock and the nearby Helen's Reef: the sad story of the worst of these, the loss of the *Norge* with 630 on board in 1904, is recalled, as also are the visits of research vessels such as the *Michael Sars* and *Pourquoi Pas?*

Part of the author's interest in Rockall stems from its natural history, and particularly its birds. Guillemots are always to be seen on Hall's Ledge in early summer, some in attitudes suggestive of incubation; but that they can ever raise young at this storm-swept site is extremely doubtful. Occasional gulls, gannets and puffins have been seen on the rock, kittiwakes are regular visitors, and fulmars are abundant on the nearby trawling-grounds Discussion of the bird records occupies one of the appendices; another is devoted to the geology, a third to the zonation and species of Algae, and there is a note on the intertidal zoology. Of interest here is the fact that the two larger animals found on Rockall, a periwinkle, *Littorina rudis*, and an Amphipod crutacean, *Hyale prevosti*, are able to maintain colonies only because they are viviparous, and do not have a free-swimming planktonic stage.

The book, which is profusely illustrated with good photographs, concludes with a bibliography.

K.W.

Animal Breeding. (Filmstrip in Eastmancolor). DR. JOHN HAMMOND. 25*s*. (With notes).

The lecture notes are written with the customary conciseness and clarity of their author, Dr. John Hammond, who also directed the compilation of the visual material. This consists of 27 single frames (vertical transverse), the majority of which are diagrams, although a few photographs are included. Among various aspects of breeding cattle, pigs and sheep dealt with in the strip are: inherited and acquired characteristics; food conversion; body formation and composition at different ages and feeding levels; selecting a dairy bull; grading up; the use of dominant genes for colour marking and the polled condition; and cross breeding sheep for economic production.

The strip, with its notes, epitomizes decades of research and experimental work, and provides sufficient material for a number of lectures. Used as a strip or as individual slides, the material should be most valuable for illustrating talks to farmers, stockbreeders and students. Most of the diagrams are well conceived and executed, and help to clarify complex facts; the use of colour could, however, have been much more fully exploited.

The filmstrip, with notes, is produced by, and obtainable from, Marian Ray, 36 Villiers Avenue, Surbiton, Surrey.

W.E.R.

Profits from Dairy Farming. (Bulletin No. 7). J. CLARK and J. E. BESSELL. Imperial Chemical Industries.

The report deals with a three-year grassland management investigation relating to 40 farms distributed over England, Wales and Northern Ireland, most of them being in the wetter western regions. Milk production is the main enterprise, and intensively managed grass the most important crop.

The data are presented in three parts. Part A sets out cost of production figures for grass, milk and sheep, together with details of the outputs, costs and incomes. The authors point out that on these farms the estimated effective production from grassland was one ton of starch equivalent, a figure which is some 30 per cent higher than the national average. They state that many farmers could obtain a greater quantity of nutrients from grassland if they could carry more livestock, and the data show that as the feed area used per cow diminished, the average milk production per acre increased. On the other hand, higher yields per cow did not have such an important influence. The higher output of milk was made possible by applying nitrogen; a return of 28 gallons was obtained for each cwt of sulphate of ammonia applied per acre. Furthermore, profits rose by £1 6*s*. for each additional 25 gallons of milk produced per acre.

In the second part the authors try to establish the reasons for variations in profit levels. This is done by a study of the effects of changes in the levels of various farm inputs on output. They conclude that apart from farm size, the most significant factors influencing output were (a) the number of pounds of nitrogen applied to grassland, (b) the expenditure on purchased feed to grazing livestock, and (c) the input of manual labour and the machinery and fuel costs per acre. These inputs together account for nearly four-fifths of the variation in output. The authors have also derived the marginal outputs for varying levels of nitrogen application, purchased feed use and labour costs. They show that these farmers would be well advised to spend more money on fertilizers for grassland rather than purchasing more feed for grazing livestock.

Finally, a comparison is made of the financial results of the 40 farms with those of a group of 280 dairy farms co-operating in the Farm Management Survey. This reveals that the latter had lower outputs, costs and farm incomes. Less was spent on fertilizers and much more on purchased feed. It would appear that if more fertilizers of the right type were applied to grassland on these farms, the farmers could cut down on purchased feed and would enjoy higher profits.

In addition to notes on definitions and conventions, and overhead charges, the Appendices contain some data on the statistical analyses used in the report and the results of such analyses.

Profits from Dairy Farming is an excellent addition to the growing volume of economic information on milk production from grassland. Agricultural advisers and students alike will appreciate the insight which it provides into new methods of analysing data for farm management purposes.

Copies of the bulletin may be obtained free from Imperial Chemical Industries Ltd., Central Agricultural Control, Nobel House, London, S.W.1.

V.H.B.

Preserving Crops for Wintering Stock. (Young Farmers' Club Booklet No. 28). M. L. YEO. Evans Bros. 2*s*. 6*d*.

Written in an easy, concise and readable style, this commendable little booklet achieves what it sets out to do; namely, to show how farmers in this country try to close the " hungry gap " that hangs over the farm in the winter.

The methods of conserving the various farm crops, such as grass, cereals and roots, that are used in the winter feeding of farm livestock, are dealt with in a logical and orderly sequence. The subject, in general, is treated on an " operational basis ", thereby avoiding undue repetition for individual crops. The excellent, well-captioned illustrations and diagrams not only make the text easier to read, but virtually eliminate any possibility of misunderstanding. However, I would have preferred to see a more popular mixture than that of grass, clover and wheat (in head) in the illustration of the use of a cutter-baler (Fig. 34).

There are, unfortunately, a few errors or misrepresentations which must be mentioned. The most serious is in the caption of illustration No. 30 on page 35, where it is stated that " 12 gallons of molasses plus 12 gallons of water (increase the water if the material is very dry) should be added to every ton of grass ". This would, indeed, result in " sweet " silage!

The example on page 24 of the amount of water to be evaporated for every 30 lb of dried produce is mathematically incorrect, although it does illustrate the importance of the " water ratio " in the process of drying.

Despite these criticisms, young farmers and others interested in the various methods that can be used for preserving crops for the winter feeding of stock will find this booklet a most concise and useful source of information.

W.E.

Animal Husbandry. J. E. NICHOLS. Seal-Hayne Agricultural College. 4*s.* (4*s.* 3*d.* by post).

The four lectures which Professor Nichols gave during the 1954-55 session under the Devon County Agricultural Association Lectureship are presented in this booklet. They are entitled " Animal Husbandry: General Principles ", " Beef and Dairy Cattle ", " Sheep and Pigs ", and " Today and Tomorrow—Methods and Aims ".

In common with other studies, agricultural training and research now involve increasing specialization, and it is useful to students and farmers alike to be presented, as in this series of lectures, with a comprehensive and well-balanced survey of developments and prospects in the complex subject of animal husbandry.

The sound approach adopted by Professor Nichols in his book *Livestock Improvement* would lead one to expect that in these lectures full weight and emphasis would be given to the development of the relationship between breeding and management of livestock, and also to the integration of animal production with the other enterprises on the farm, and in these respects the lectures excel. The author has obviously read widely and with discrimination in the field of animal production and has brought a shrewd, penetrating and critical mind to bear on the consideration and presentation of the results of research workers in these fields.

At certain points nutrition is not handled with the same deft assurance with which the author deals with the breeding aspect; thus he appears to subscribe, without substantiating arguments, to the fashionable notion that the distinction between maintenance and production in the rationing of farm animals is ill-founded.

T.L.B.

An Economic Analysis of Pig Production on South-Western Farms, 1954-55. (University of Bristol, Department of Economics Report No. 93). E. BURNSIDE and W. M. STRONG. 2*s.* 6*d.*

The particular interests of this report arise from the fact that it deals with the fortunes of pig-keepers during the first full year of free marketing, and the statistics which are provided emphasize the doubts and uncertainties which characterized those early days of de-control. It records the results of pig-keeping on sixty-two farms in the three south-western counties, where production from pigs is such an important source of farm income. On farms where figures from earlier years are available, the returns for 1954-55 show the familiar pattern of declining profit margins from pig-keeping.

Bearing in mind the expectation of reductions over the next few years in the high rate of Exchequer support for pig-meat, the report focuses attention on maintaining the profitability of pig-keeping by outlining factors which influence returns as well as costs per pig. Cost data emphasize the paramount importance of food, which accounts for almost 88 per cent of total costs, and the economics of compounds versus home-mixed rations are fully discussed. A possible saving of £3 a ton by home-mixing is obviously attractive to anyone with a substantial throughput. Whichever way food is bought, there is a need for its more efficient feeding, and the average conversion rate of 4.1 lb of meal per pound liveweight gain for fattening pigs leaves plenty of scope for improvement.

The report is particularly convincing when it deals with the wastage of profits due to mortality of young pigs. The farms under review, after achieving the respectable average of seventeen pigs per sow per year, manage to wean less than fourteen. The authors point out that an increase of one weaner per sow each year would add about £5 per sow to the output of the breeding herd at very little extra cost.

As usual with such surveys, the authors record a wide range of profitability and leave us with the hope that, despite foreign competition and reduced support prices, some farmers will still make pigs pay.

H.B.

The Small Dairy Farm. A. G. THOMASON. A. and C. Black. 12*s.* 6*d.*

The author saw the need for a book dealing with the problems of the small dairy farm and he has courageously set out to cover every aspect of the wide subject. It is a pity, however, that he did not allow himself more room to go into detail. Often it seems that his book is too brief to be of very much help to the beginner, and at other times the statements are so sweeping that the reader will wish Mr. Thomason had enlarged upon the matter by supporting proof.

In the chapter "Making a Start" he attempts to summarize, in sixty lines, the advantages, disadvantages and descriptions of all the dairy breeds. He speaks of small and large fat globules (but omits to say the difference is only one twelve-thousandths part of an inch), of butterfat percentages, horns, and the colour of the different breeds. Surprisingly, he does not mention solids-not-fat—a subject about which anyone starting in dairy farming today needs to be very conscious.

To say "Ninety per cent of cows sold in the market are sold because of some defect" is a sweeping statement which surely calls for substantiation. Few experienced farmers would agree that the percentage is anything like as high; but if it is true, then it is strange that thousands of cows are bought every week.

Quite rightly, the author says that butter- and cheese-making are uneconomic at today's prices. Nevertheless, he devotes a whole chapter to this subject, whereas nowhere does he give the reader any help in planning the financial side of farming—an unfortunate omission. Then again, a chapter is devoted to reclaiming marginal land, while machinery for the farm is covered in two pages! In speaking of haymaking, Mr. Thomason writes that the pick-up baler is one of the "simplest ways of making hay". Few farmers would agree that it is simple to make good hay but, of course, the pick-up does speed the job of collecting it together. However, it is the speed of operation that, all too often, results in mouldy hay if the hay is not really fit when starting to pick up.

The chapter on licences and laws could, with advantage, be enlarged. No mention is made of the Attested Herds Scheme or the Movement of Animals (Records), 1926, Regulations, both of which affect dairy farmers very much.

The Small Dairy Farm has been written as a reference book, but there is no index, and the illustrations, while excellent in themselves, do not help the reader to understand the complex subject of the book. I fear that it needs more than 122 pages to do the theme justice.

F.H.

Le Vison (The Mink). R. MAMY and M.-H. MOTTE. Maison Rustique. Paris. F.750.

M. Mamy, a French mink-breeder of twenty-five years experience, and Herre M.-H. Motte, a Danish rearer and exponent of the most up-to-date methods in use in his country, have written separate accounts of mink-farming for the fur trade in their own countries. The book, written in French, is detailed and comprehensive, covering the natural history of the animal in the wild, the construction and siting of the cages and of the farm itself, food, health, mating, the skinning and preparation of the pelt, the recording of data, and genetics. There is also an interesting chapter on the Danish rearers' federation and its co-operative trading and services, in a country which produces 180,000 pelts a year.

Many practical points for the beginner are given, such as the reminder that the farm should be near a butcher or fish merchant, since fresh flesh and offal are the mink's most important food in captivity. Both authors stress the need to start with good, healthy stock, and to maintain a high standard of hygiene on the farm—essential to an animal which is delicate in some respects. A list of diseases and remedies is given. Because the mink is nervous, M. Mamy advises the wearing of the same clothes, even the same hat, each day, while Herre Motte explains that in Denmark mink-farms show a triangular sign on a high pole which warns aircraft over the farm not to fly below 1,200 feet!

The most important chapters, and the most interesting to the expert, are those on food and mating. In France, meat forms the main part of the diet plus a little fish, whilst in Denmark fish is the most important item, with meat playing a much smaller role. In Denmark, to promote mating, hormone injections are sometimes given, with some success, to frigid female minks.

M.G.R.

Hannah Dairy Research Institute Report for the Three Years Ending 31st March, 1956.

Although this report is basically a review of the advanced research work undertaken by the Hannah Institute in the various fields of milk production (grass and dairy husbandry, biochemistry, nutrition, physiology, veterinary pathology, bacteriology, and technical chemistry), nevertheless many of the results quoted do have an immediate bearing on practical dairying problems. For example, experiments on the manuring of grass for drying, now in their ninth year, continue to show the importance of potash in maintaining high yields from grass which receives heavy (3 cwt " Nitro-Chalk " per acre) nitrogen dressings after each cut. In some other work on grassland management, increases of 30 per cent in dry matter yields of herbage were obtained in 1954 by close cutting within 1 inch of ground level, as compared with cutting to 3 inches. This striking effect was also observed in 1955.

Strip grazing with the addition of 8 lb concentrates a day led to higher milk yields than ordinary (no concentrates) strip grazing or cutting the grass and feeding it either in the field or indoors. But ordinary strip grazing proved to be the most economic method. Similar results were obtained in winter feeding experiments in which cows getting a basal ration of home-grown feeds received 2 or 4 lb of concentrates, which were either low or high in digestible crude protein, for each gallon of milk. The greatest profit, though not the highest milk yield, followed the use of 2 lb of low protein concentrates.

The rotational grazing of calves involving weekly changes to fresh paddocks which had been rested for three weeks, gave marked increases in growth rate, compared with calves fed in small exercise paddocks on conserved feed and concentrates.

Work on the keeping quality of milk from cows fed very small quantities of menadione gave little support to the claims made for this substance. Several aspects of the solids-not-fat content of milk are dealt with in the report, and it is concluded that although the fat and s.n.f. contents are closely correlated, the heritability of s.n.f. may be slightly higher. Studies of herds giving low s.n.f. values have indicated that, in the absence of disease, low values are mainly due to unsuitable or inadequate feeding.

Copies of the report can be obtained free from the Hannah Dairy Research Institute, Kirkhill, Ayr.

A.J.L.L.

Tractors on the Farm (5th Edition). H. J. Hine. Farmer and Stock-Breeder. 15*s*.

The place of tractors on the farm has been subject to a profound change in the last two decades. They were already being widely used before the Second World War, but, except on the farms of the relatively few pioneers of mechanization, were applied to traction rather than integrated into the farming system. The circumstances of the war brought the tractor to practically every farm, and, in 1942, when *Tractors on the Farm* first appeared, it had begun to be assimilated into our agriculture. Farmers and their sons were—through necessity or inclination—developing their use of mechanical power and wanted to know more about the workings and capabilities of their tractors. Mr. Hine's little book aptly met their need.

Successive editions have reflected not only the expansion in the number of farm tractors, the increase in their versatility, and developments in engineering design, but also the general adoption of a mechanized approach to farming. These changes have meant extensive revision in the fifth edition to bring it up to date: indeed the book has been very largely rewritten and is much larger than its predecessors. The few paragraphs that have survived intact from the first edition have done so because the information they impart now is as accurate today as it was in 1942. A solitary exception, perhaps, is the reference to detachable half-rims on p. 121. Previous chapters on the principles, maintenance, and utilization of tractors have now been expanded into several chapters dealing with these subjects in greater detail. Writing on the choice of a tractor, the author proceeds from the sensible initial assumption that the user will know something of tractors already, to a discussion of economic and technical factors, including an explanation of tractor testing methods.

The book is well illustrated and has an excellent index and a useful bibliography. In its new form it should prove of use not only to farmers, students and tractor operators, but also to those concerned in the maintenance of tractors.

P.H.B.

BOOK REVIEWS

Agriculture in the World Economy. F.A.O., Rome. H.M. Stationery Office, London. 5*s.* (5*s.* 3*d.* by post).

Agriculture in the World Economy, a companion volume to *The Farm and the City*, concentrates more on details of agricultural production.

Everyone knows that man must eat and that agriculture and fishing are the only present means of providing food, yet all too frequently city dwellers fail to realize the industry's importance in the world's economy. The writers set out to put this right, and they start with an interesting definition of that elusive term agriculture. This definition, which was framed by the French Rural Economy Society in 1949, states that agriculture is: "Work, the purpose of which is to harness the forces of nature in order to produce plants and livestock to meet human needs". The publication proceeds to follow the story right through in ten short chapters and a conclusion, though in fact it can nearly all be seen from some twenty-six diagrams and maps. One of the maps (Fig. 3) is novel and will, for that reason, claim special attention. It is a map of the world but with a difference—the countries are arranged in a stylized form, with their areas shown proportional to their populations and shaded to correspond with their average daily calorie intake of food. Britain, deeply shaded, is among the well-fed countries and becomes the size of France; Canada, also deeply shaded, shrinks to an insignificant strip instead of being bigger than the U.S.A.; and Australia becomes a small, dark, well-fed area in comparison with a large, moderately-fed Indonesia and an enormous India. A list of the populations of the world is nothing like so impressive as this map.

Similarly, a world comparison of the different regions' population, agricultural land and production and income is set out in a striking figure as a frontispiece. This shows that the Far East has nearly 50 per cent of the world's population, 15 per cent of its agricultural land, 10 per cent of its income, and nearly 30 per cent of its agricultural production, whereas North America has 8 per cent of the population, 12 per cent of the land, 45 per cent of the income and 20 per cent of the agricultural production. In other words, the land in the Far East is more productive than in North America—a result which not everyone would have expected.

Other interesting points are brought out very clearly in the diagrams. For instance, Figs. 23 and 24 deal with farm income and national income, the latter figure showing how the agricultural population has dropped in some of the developed countries, and also agriculture's share of the national income.

In many of the diagrams, I think too much use is made of index numbers. Fig. 23 would have been more interesting had the national incomes and agricultural incomes been compared on an absolute basis rather than as index numbers, but this is a minor point in an otherwise admirably presented and short *exposé* of the position of agriculture in the world's economy.

G.O.

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Two booklets just received from The Ramblers' Association are: *Save our Commons* (evidence submitted to the Royal Commission by the Association), 36 pages, price 2*s.*, and *Right of Way* (a second edition of the popular brochure which was first published in 1944), 28 pages, price 1*s.* 6*d.*

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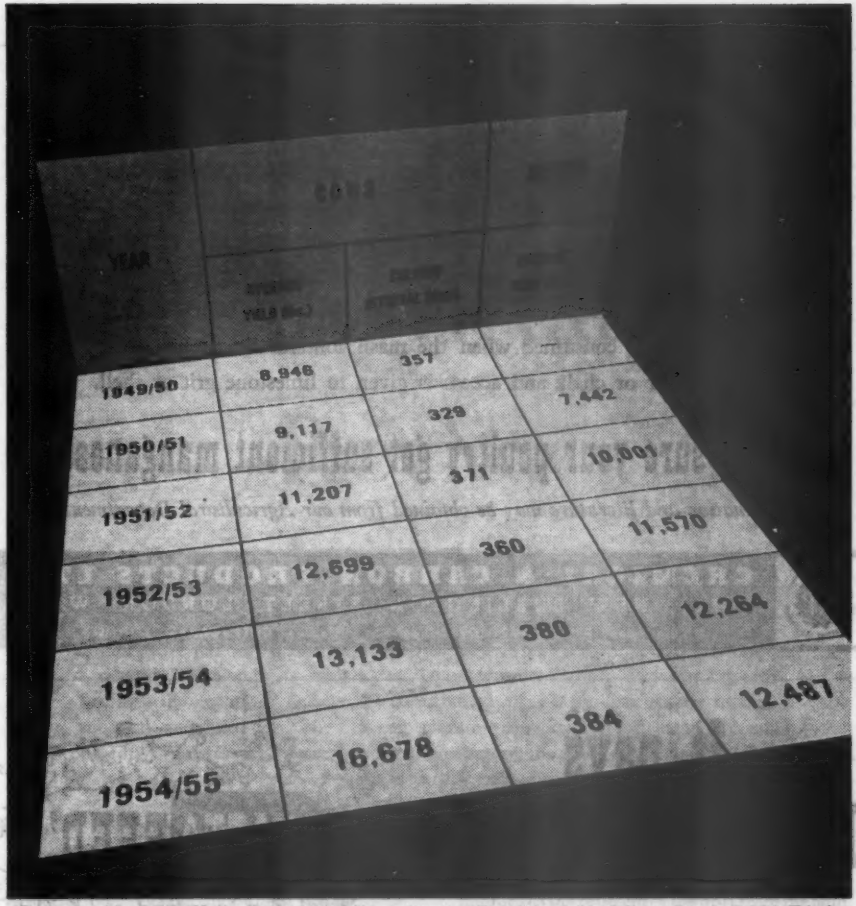

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